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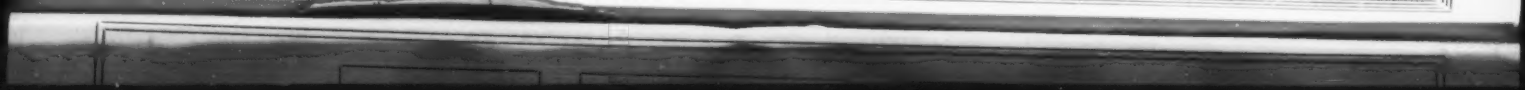

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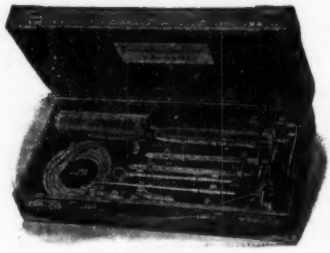

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ORIGINAL ARTICLES

THE MANAGEMENT OF POSTPNEUMONIC EMPYEMA BASED UPON 310 CASES.

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Among approximately 4000 patients with pneumonia, empyema necessitating repeated aspirations or operation has occurred in 310. The actual incidence of empyema in pneumonia has, however, been higher in this locality than these figures indicate. In many patients with a rapidly spreading pneumonia leading to a fatal outcome in three or four days, empyema was diagnosed prior to death. The advisability of operation upon these patients was not considered, nor have they been included in this report. During the epidemic of measles and pneumonia at the Fort Riley Reservation, which occurred in the fall and winter of 1917–1918, during the epidemic of streptococcus pneumonia which occurred during March and April, 1918, as well as during the epidemic of influenzal pneumonia, September 15 to November 1, 1918, a sufficient amount of purulent fluid in the thorax to warrant the use of the term, empyema, could be determined prior to death in many patients. In fact, exudation of serous and later of seropurulent fluid, in greater or lesser amount, into the pleural cavities took place so frequently in these extensive epidemic pneumonias that its occurrence might be considered almost the rule rather than the exception. In many such patients death occurred so rapidly that the presence of fluid was looked upon as an incident rather than the determining factor in producing death.

Depending upon the locality, the etiological factors producing pneumonia may be expected to show variation. From experience in army base hospitals, two facts of importance have been rather universally recognized. The first fact refers to the general prevalence of the streptococcus (normally one of the hemolytic varieties) in pneumonia following measles. The second fact refers to the prevalence of the streptococcus, likewise one of the hemolytic varieties, as an organism associated in many localities with the pneumococcus in the production of epidemic pneumonia not preceded by measles or influenza, but as a distinct type in which the pneumococcus has appeared to play but a minor role. In certain localities, during the recent epidemic of influenzal pneumonia, the pneumococcus was the prevalent type of infection both in the acute disease and in the subsequent empyemas. In other localities the pneumococcus and streptococcus have been associated, while in others streptococcus pneumonias have been more frequently encountered than had been heretofore generally recognized.

In the series of empyema here reported only those are included which required treatment by aspiration or operation. There were available for this report 35 empyema patients who recovered by repeated aspirations alone, while 275 came to operation. Those patients were not included who died within a few days of admission with an established diagnosis of empyema or those who died during the course of aspirations designed for their relief, but who, because of activity of the pneumonic process, acute bilateral empyema, purulent pericarditis, meningitis or other serious complications, were not considered reasonable operative risks.

Because of the interest attached to variations of treatment, with increasing experience, these empyema patients have been grouped, depending largely upon three-time intervals, as follows:

1. First series: Early operation (October 20, 1917, to January 21, 1918), 85 cases. Mortality, 61.2 per cent.

2. Second series: Early aspirations and late operation (January 12, 1918, to August 10, 1918), 96 cases. Mortality, 15.6 per cent.

3. Third series: Early aspirations and late operation (October 18, 1918, to February 14, 1919), 94 cases. Mortality, 9.5 per cent.

The three series of operated empyemas are comparable as to number. Each series represents as accurately as possible, but with some overlapping, different types of preceding pneumonia. The series are also comparable as to type of infection.

First Series, Early Operation. This series of 85 patients occurred during the measles epidemic which affected the 89th and 92d Divisions of the Army, stationed at Camp Funston. The epidemic began about October 18, 1917, and reached its crest during the week ending December 28, 1917, gradually declining to February 15, 1918, after which to May 18 the disease existed in sporadic form with each new influx of recruits. During this period about 3000

patients with measles were admitted to the base hospital. During October but 1 empyema operation was performed; during November, 24; during December, 42; from January 1 to January 21, 1918, 18. These patients were operated upon as soon as the diagnosis of empyema was made and are therefore described under the heading of early operation. The following tables bring out the important facts relative to the mortality:

TABLE I.—SERIES I, EARLY EMPYEMA OPERATIONS, OCTOBER 20, 1917, TO JANUARY 21, 1918.

	Total operations.	Deaths.	Mortality, per cent.
October, 1917	1	1	100.0
November	24	15	62.5
December	42	27	64.3
January, 1918	18	9	50.0
Total	85	52	61.2

TABLE II.—TYPE OF OPERATION.

	Number.	Deaths.	Mortality, per cent.
Costectomy	50	28	56.0
Thoracotomy	32	21	65.6
Unrecorded	3	3	
	85	52	
Costectomy, right	32	14	43.7
Thoracotomy, right	18	12	66.6
Costectomy, left	18	14	77.7
Thoracotomy, left	14	9	64.3
	82	49	
Unrecorded	3	3	
	85	52	61.2

TABLE III.—ANESTHESIA.

	Number.	Deaths.	Mortality, per cent.
Local	71	43	60.5
General	11	6	54.5

TABLE IV.—TYPE OF PNEUMONIA PRECEDING EMPYEMA.

	Number.	Deaths.	Mortality, per cent.
Lobar pneumonia	46	25	54.3
Measles pneumonia[1]	39	27	69.2
Total	85	52	61.2

[1] The term measles pneumonia includes lobar and bronchopneumonia following measles. It was difficult clinically to distinguish the type in many patients. In a series of 46 necropsies upon measles-pneumonia patients, lobar pneumonia was found in 41 per cent. and bronchopneumonia in 54 per cent.

TABLE V.—TYPE OF INFECTION IN EMPYEMA FLUIDS.

	Strept. hem.	Strept. non-hem.	Pneumo.	No record or growth.
Lobar pneumonia empyema, recovered	6	4	8	3
Lobar pneumonia empyema, death	7	7	7	4
	13	11	15	7
Measles pneumonia empyema, recovered	3	6	1	2
Measles pneumonia empyema, deaths	9	10	3	5
	12	16	4	7

TABLE VI.—PER CENT. RECOVERIES AND DEATHS AS TO TYPES OF PNEUMONIA AND INFECTION.

	Number.	Strept., per cent.	Pneumo., per cent.
Lobar pneumonia empyema, recovered	18	25.6	20.5
Lobar pneumonia empyema, death	21	35.9	17.9
	39	61.5	38.4
Measles pneumonia empyema, recovered	10	28.1	3.1
Measles pneumonia empyema, death	22	59.3	9.4
	32	87.4	12.5

TABLE VII.—EMPYEMA RECOVERIES AND DEATHS AS TO TYPES OF INFECTION.

	Number.	Recovered, per cent.	Deaths, per cent.
Streptococcus	52	36.5	63.3
Pneumococcus	19	47.4	52.6
	71		

DISCUSSION. The fact was not well recognized at the time of operation upon these patients that pleuritis almost universally accompanied a rapidly spreading pneumonia following measles and that seropurulent or serosanguineous fluid containing streptococci (usually one of the hemolytic varieties) was to be expected in approximately 75 per cent. of those patients who were to succumb whether the chest was drained or not. Costectomy or thoracotomy did not necessarily entail the danger of lung collapse, for in many of them the lung on the affected side was found to be collapsed from pressure of fluid at the time of operation or verification of such condition was obtained at necropsy in the non-operated patients. The danger of an open pneumothorax when associated with an active pneumonic process and diminished alveolar air space was not appreciated at this time. The lungs usually in such cases presented the picture of diffusely scattered areas of peribronchial pneumonia

[2] Including streptococcus types not differentiated.

(so-called interstitial pneumonia). Operation was done in the hope of affording relief to patients literally drowning in their own septic fluids. That the procedure was not without hope was borne out by the fact that 38.8 per cent. of 85 patients so operated recovered. The high mortality in December, 1917, of 64.3 per cent., soon led to the conclusion that the drainage operation and open pneumothorax carried with it great danger to the patient with an active pneumonic process, and that while the operation carried with it the element of possible benefit to approximately 38 per cent. of the patients, there was great probability that death was hastened in the remaining 62 per cent. It was believed, in other words, that many of these patients were not reasonable operative risks and that many would die irrespective of the treatment employed, since 17, or 33 per cent., died within seventy-two hours from the time the open pneumothorax was secured.

With this end in view the attempt was made, about January 12, 1918, to repeatedly aspirate, in closed circuit by the Potain aspirator, fluids from the chest as soon as diagnosed in active pneumonias. Such aspiration, depending upon the character and amount of fluid was performed every day or alternate day until such time as it was believed the activity of the pneumonic process had subsided. It soon became evident that a considerable number of patients who appeared fatally stricken were relieved by the aspirations. It also was evident among those who died that the end was not hastened, but was in many instances delayed because of the aspirations.

Second Series (Late Operation). The first operation under this repeated aspiration plan was performed January 29, 1918. Upon this patient a total of nine aspirations had been performed during an interval of seventeen days subsequent to the diagnosis of empyema. Between January 29 and August 10, 1918, 96 patients with empyema were operated, following this plan of procedure. Daily irrigation of the empyema cavity with neutral solution of chlorinated soda was used in these patients. There were 15 deaths, a mortality of 15.6 per cent. Most of the patients in this group developed empyema following lobar pneumonia, but the streptococcus, as in the measles epidemic, continued to be the most frequent infection in the empyema fluids. During the first series of empyema operations the streptococcus was isolated in 52 of 71 operated empyemas, or 73.2 per cent. During the second series the streptococcus was isolated in 70 of 95 operated empyemas, or 73.6 per cent. Many of the patients of this second series developed empyema following streptococcus lobar pneumonia, which occurred in severe epidemic form during March and April, 1918. The mortality by months is shown in Table 8.

TABLE VIII.—SERIES II, LATE EMPYEMA OPERATIONS, JANUARY 29, TO AUGUST 10, 1918.

	Total operations.	Deaths.	Mortality, per cent.[6]
January, 1918	2	0	0
February	14	2	14.3
March	9	3	33.3
April	44	7	15.9
May	15	2	13.3
June	8	1	12.5
July	3	0	0
August	1	0	0
	96	15	15.6

TABLE IX.—TYPE OF OPERATION.

	Number.	Deaths.	Mortality, per cent.
Costectomy	78	14	17.9
Thoracotomy	18	1	5.5
	96	15	15.6
Costectomy, right	36	5	13.9
Thoracotomy, right	8	1	12.5
Costectomy, left	42	9	21.4
Thoracotomy, left	10	0	0.0
	96	15	15.6

TABLE X.—ANESTHESIA.

	Number.	Deaths.	Mortality, per cent.
Local	68	12	17.6
General	28	3	10.7
	96	15	15.6

TABLE XI.—TYPE OF PNEUMONIA PRECEDING THE EMPYEMA.

	Number.	Deaths.	Mortality, per cent.
Lobar pneumonia	90	14	15.5
Measles pneumonia	6	1	16.6
	96	15	15.6

TABLE XII.—TYPE OF INFECTION IN EMPYEMA FLUIDS.

	Strept., hem. per cent.	Strept., non-hem. per cent.	Pneumo. per cent.	Strept and pneumo. per cent.	No record.
Lobar pneumonia empyema:					
Recovered	33	20	20	2	1
Death	8	3	3	0	0
	41	23	23	2	1
Measles pneumonia empyema:					
Recovered	3	1	1	0	0
Death	1	0	0	0	0
	4	1	1	0	0

TABLE XIII.—PERCENTAGE OF RECOVERIES AND DEATHS AS TO TYPE OF PNEUMONIA AND INFECTION.

	Number.	Strept., hem., per cent.	Strept., non-hem., per cent.	Pneumo., per cent.	Pneumo. and strept. per cent.
Lobar pneumonia empyema:					
Recovered	75	37.1	22.4	22.4	2.2
Death	14	9.0	3.4	3.4	0.0
	89	46.1	25.8	25.8	2.2
Measles pneumonia empyema:					
Recovered	5	50.0	16.6	16.6	0.0
Death	1	16.6	0.0	0.0	0.0
	6	66.6	16.6	16.6	0.0

TABLE XIV.—EMPYEMA RECOVERIES AND DEATHS AS TO TYPES OF INFECTION.

	Number.	Recovered, per cent.	Deaths, per cent.
Streptococcus	69	82.6[3]	17.4[4]
Pneumococcus	24	87.5	12.5
Mixed infection (streptococcus and pneumococcus)	2	100.0	
	95		

Table 15 shows the average number of aspirations performed and the average number of days before operation in the 96 patients with empyema constituting the second series.

TABLE XV.—NUMBER OF ASPIRATIONS AND DAYS BEFORE OPERATION.

	Number.	Average number of aspirations before operation.	Average number of days before operation.
Recovery	81	6[5]	19[6]
Death	15[7]	6	21

SERIES III (LATE EMPYEMA OPERATIONS). The third series of empyema followed pneumonia incident to the epidemic of influenza during the autumn of 1918. Between October 18, 1918, and Feb-

[3] Among the recoveries, three patients had post-scarlet fever pneumonia, empyema (Streptococcus hemolyticus) and nephritis. Two patients subsequent to lobar pneumonia and the healing of their empyemas were found to have active pulmonary tuberculosis. One patient had lobar pneumonia with empyema which was operated, followed by pneumonia on the opposite side with pleural effusion which was relieved by aspiration and eventual recovery.

[4] Four deaths occurred from nephritis in post-scarlet fever pneumonia and empyema. One death occurred from streptococcus endocarditis and nephritis following post-scarlet fever lobar pneumonia and empyema.

[5] Not including one patient who had bilateral empyema with four distinct pockets; a total of 68 aspirations were performed before costectomy, followed by recovery.

[6] Not including two patients from whom operation was delayed for an unusually long period because of their critical condition due to nephritis. Both recovered.

[7] Four of the fifteen deaths resulted from post-scarlet fever nephritis. One death resulted from post-scarlet fever endocarditis and nephritis.

ruary 14, 1919, 94 patients required operation. Of these 9 have died to April 8, 1919; 73 have recovered; 10 are still in hospital, with prognosis favorable; while 2 patients have an unfavorable prognosis, due to tuberculosis with large pyopneumothorax in each.

TABLE XVI.—TYPE OF OPERATION.

	Number.	Deaths.	Mortality, per cent.[8]
Costectomy	88	7	7.9
Thoracotomy	6	2	33.3
	94	9	9.5

TABLE XVII.—ANESTHESIA.

	Number.	Deaths.	Mortality, per cent.[9]
Local	91	9	9.8
General	3	0	0.0
	94	9	9.5

TABLE XVIII.—TYPE OF PNEUMONIA PRECEDING THE EMPYEMA.

	Number.	Deaths.	Mortality, per cent.[10]
Influenzal pneumonia[11]	41	2	4.9
Lobar pneumonia	30	5	16.6
Measles pneumonia	17	1	5.9
Bronchopneumonia	6	1	16.6
	94	9	9.5

TABLE XIX.—TYPE OF INFECTION IN EMPYEMA FLUIDS.

	Number.	Per cent.
Streptococcus hemolyticus	53	62.3
Streptococcus, non-hemolytic	6	7.0
Pneumococcus	25	29.4
Streptococcus viridans and pneumococcus	1	1.1
	85	
No record or contamination	9	
	94	

TABLE XX.—EMPYEMA RECOVERIES AND DEATHS AS TO TYPE OF INFECTION.

	Number.	Recovered, per cent.	Deaths, per cent.[12]
Streptococcus	59	93.3	6.7
Pneumococcus	25	84.0	16.0
Mixed infection (streptococcus and pneumococcus)	1	100.0	

[8] To April 8, 1919. [9] To April 8, 1919. [10] To April 8, 1919.

[11] During the epidemic of influenza, the pneumonia was of lobar type in 72.6 per cent. of 55 patients upon whom necropsy was performed.

[12] To April 8, 1919.

Table 21 shows the average number of aspirations performed and the average number of days before operation in the ninety-four empyema patients of the third series.

TABLE XXI.—NUMBER OF ASPIRATIONS AND DAYS BEFORE OPERATION.

Number.	Average number of aspirations before operation.	Average number of days before operation.
94	3.7	13.5

Discussion of Types of Infection in the Three Series. In Table 22 the percentage of cultures positive for streptococcus and pneumococcus in the three series of operations have been arranged for purposes of comparison. It will be observed in each series that the streptococcus (usually one of the hemolytic varieties) has been the type of infection responsible for the condition in approximately 70 per cent. of the patients.

TABLE XXII.—COMPARISON OF TYPES OF INFECTION IN THREE SERIES OF EMPYEMA.

	Number.	Strept., per cent.	Pneumo., per cent.
First series	71	73.2	26.7
Second series	95	73.6	26.3
Third series	85	70.4	29.4

For purpose of comparison as influenced by the radically different treatment in the first as compared with the second and third series the following table is given. It will be observed that in the first series, when early operation was done, the percentage of recoveries in streptococcus empyema was 36.5, while in the second and third series, when late operation was done, the percentage of recoveries in streptococcus empyema was 82.6 and 93.3 respectively. In the first series the percentage of recoveries in pneumococcus empyema was 47.4, while in the second and third series the percentage of recoveries in pneumococcus empyemas was 87.5 and 84 respectively.

TABLE XXIII.—COMPARATIVE RECOVERIES AS TO TYPE OF INFECTION IN THREE SERIES OF EMPYEMA.

	Number.	Strept. recoveries, per cent.	Pneumo. recoveries., per cent.
First series	71	36.5	47.4
Second series	95	82.6	87.5
Third series	85	93.3	84.0

Necropsy Findings. Necropsies were performed upon forty-eight patients who died subsequent to empyema operations. Abstracts of the clinical diagnoses and the necropsy findings have been arranged in sequence for the three series of operations.

FIRST SERIES EMPYEMA, NECROPSY ABSTRACTS.[13]

No. 9, 1917. Clinical Diagnosis: Pneumonia, lobar left; empyema, operated left.

Anatomical Diagnosis: Pneumonia, lobar left lower; empyema, left; pleurisy, fibrinous right.

No. 11, 1917. Clinical Diagnosis: Pneumonia, lobar right lower; empyema, operated right.

Anatomical Diagnosis: Pneumonia, lobar right with abscess formation; empyema, right; pericarditis, purulent acute; endocarditis (mitral and aortic), acute.

No. 24, 1917. Clinical Diagnosis: Measles; pneumonia, broncho-bilateral; empyema, operated right.

Anatomical Diagnosis: Pneumonia, lobar with cavity formation right; empyema, right; pleuritis, fibrinopurulent right.

No. 26, 1917. Clinical Diagnosis: Measles; pneumonia, broncho, right; empyema, operated right.

Anatomical Diagnosis: Empyema, right; peritonitis, plastic with adhesions between diaphragm and liver.

No. 27, 1917. Clinical Diagnosis: Pneumonia, postoperative broncho, right, following appendectomy; empyema operated right.

Anatomical Diagnosis: Bronchopneumonia; empyema, right; peritonitis purulent diffuse; nephritis, parenchymatous acute; fatty degeneration of liver; ulcerative endocarditis.

No. 31, 1917. Clinical Diagnosis: Measles; bronchopneumonia; bilateral; empyema, operated right.

Anatomical Diagnosis: Pneumonia, lobar right; infarcts, hemorrhagic left lung; empyema, localized right; endocarditis, ulcerative pulmonary valves; embolism and thrombosis of mesenteric vessels with diffuse hemorrhage into mesentery and omentum.

No. 36, 1917. Clinical Diagnosis: Measles; pneumonia, lower left and lower right; empyema, operated right.

Anatomical Diagnosis: Pneumonia, lobar left; empyema, right; endocarditis, vegetative mitral and aortic valves; nephritis, diffuse subacute.

No. 37, 1917. Clinical Diagnosis: Measles; bronchopneumonia, bilateral; empyema, operated right.

Anatomical Diagnosis: Pleuritis, fibrinous right; retraction and edema of right lung; nephritis, parenchymatous subacute; fatty degeneration of liver.

No. 4, 1918. Clinical Diagnosis: Measles; pneumonia, lobar right; empyema, operated left.

Anatomical Diagnosis: Pneumonia, lobar of upper and middle lobes right; empyema, bilateral.

[13] In these necropsy abstracts the sequence of clinical diagnoses preceding the empyema is given. This sequence may not correspond with the findings at necropsy because of the long interval in some instances between operation and death.

No. 6, 1918. Clinical Diagnosis: Measles; pneumonia, lobar left; empyema, operated left.

Anatomical Diagnosis: Empyema, bilateral; pericarditis, purulent acute; nephritis, parenchymatous acute.

No. 8, 1918. Clinical Diagnosis: Pneumonia, broncho, bilateral; empyema, operated right with probable extension to left.

Anatomical Diagnosis: Pneumonia, lobar right and lower lobe left; empyema, right; pericarditis, acute (early).

No. 9, 1918. Clinical Diagnosis: Measles; pneumonia, broncho, bilateral; empyema, operated left.

Anatomical Diagnosis: Empyema, left; pericarditis, purulent acute (200 c.c.); peritonitis, diffuse acute.

No. 10, 1918. Clinical Diagnosis: Measles; pneumonia, lobar right; empyema, operated right.

Anatomical Diagnosis: Pneumonia, lobar lower left; empyema, right; tuberculosis, fibroid, right lung with calcified and cheesy peribronchial glands.

No. 12, 1918. Clinical Diagnosis: Pneumonia, broncho, left; empyema, operated left.

Anatomical Diagnosis: Pneumonia, broncho, left (extensive), less marked in right lung; large abscess in lower lobe of left lung; empyema, left, well drained; edema of both lungs.

No. 13, 1918. Clinical Diagnosis: Pneumonia, lobar, left; empyema operated, left; empyema, right; erysipelas, facial; nephritis, acute.

Anatomical Diagnosis: Bronchopneumonia, right, with abscess of lower lobe; localized dry empyema, right; pleural thickening and adhesions following rib resection, left; nephritis, acute; septic spleen; hyperemia and edema of brain.

No. 14, 1918. Clinical Diagnosis: Measles; bronchopneumonia; empyema, operated right; probable pericarditis.

Anatomical Diagnosis: Pneumonia, broncho, bilateral; empyema bilateral; substernal pus pocket, left; pericarditis, purulent acute (1000 c.c.); peritonitis, acute (early).

No. 17, 1918. Clinical Diagnosis: Pneumonia, lobar, right; empyema, operated right.

Anatomical Diagnosis: Peritonitis, purulent, diffuse; empyema, right.

No. 18, 1918. Clinical Diagnosis: Pneumonia, lobar lower left and right; empyema, operated right.

Anatomical Diagnosis: Carnification of right lung with interstitial changes; thickening of right pleura; nephritis, parenchymatous acute.

No. 20, 1918. Clinical Diagnosis: Measles; pneumonia, lobar (early), right; empyema, operated left.

Anatomical Diagnosis: Pneumonia, lobar, lower right (early); empyema, left with retraction of lung; thickened pleura and pleural

pus pockets; pericarditis, purulent acute; nephritis, parenchymatous acute.

No. 24, 1918. Clinical Diagnosis: Pneumonia, lobar, lower left; empyema, operated left; arthritis, acute.

Anatomical Diagnosis: Pneumonia, lobar, lower left, and entire right lung; empyema, bilateral, with drainage of left; substernal pus pocket, right; parenchymatous degeneration, acute, of kidneys.

No. 25, 1918. Clinical Diagnosis: Measles, pneumonia, lobar right; empyema, operated right; probable pericarditis.

Anatomical Diagnosis: Pneumonia, unresolved, right lung with abscess in upper lobe; empyema, right; substernal pus pocket, right; parenchymatous degeneration, acute, of liver and kidneys.

No. 26, 1918. Clinical Diagnosis: Pneumonia, lobar, left and right lower; empyema, operated left; peritonitis.

Anatomical Diagnosis: Pneumonia, lobar, left; compensatory emphysema of right lung; empyema, left; pleuritis, fibrinopurulent, lining entire anterior and lateral surfaces of left chest and lung; septic spleen.

No. 33, 1918. Clinical Diagnosis: Measles; pneumonia, broncho, right; empyema, operated, right; toxic myocarditis.

Anatomical Diagnosis: Retraction and carnification of right lung; empyema, right; substernal pus pocket, right; peritonitis, acute, diffuse with perihepatitis and perisplenitis.

No. 39, 1918. Clinical Diagnosis: Pneumonia, lobar, left; empyema, bilateral (operated right); peritonitis.

Anatomical Diagnosis: Pneumonia, lobar, left; empyema, bilateral; walled-off pus pockets, left, anterolateral chest wall between upper and middle lobes of right lung and between pericardium and sternum on right; peritonitis, acute, diffuse; parenchymatous degeneration, acute, of kidneys, liver and spleen.

No. 44a, 1918. Clinical Diagnosis: Pneumonia, right and left; empyema, operated, left; probable peritonitis, mitral regurgitation.

Anatomical Diagnosis: Empyema, left; substernal pus pocket; retraction of left lung; pleural effusion (400 c.c.), right, with edema of lung; pericarditis, purulent chronic, with erosion of heart muscle and fibrous thickening of tissue in region of auriculoventricular bundle; ascites (700 c.c.).

No. 57, 1918. Clinical Diagnosis: Measles; bronchopneumonia, right; empyema, operated, right; intrapleural hemorrhage; probable necrosis and gangrene of right lung.

Anatomical Diagnosis: Empyema, right; collapse of right lung with necrotic areas and intrapleural hemorrhage.

No. 61, 1918. Clinical Diagnosis: Measles; pneumonia, lobar, right; empyema, operated right; bronchopleural communication right.

Anatomical Diagnosis: Empyema, healed right; tuberculous nodules in lungs, spleen, liver, kidneys, pleura and peritoneal surface of diaphragm; nephritis, parenchymatous acute; edema of brain.

SECOND SERIES EMPYEMA, NECROPSY ABSTRACTS.

No. 67, 1918. Clinical Diagnosis: Pneumonia, lobar, right lower and entire left; empyema, bilateral (operated left); nephritis, acute.

Anatomical Diagnosis: Empyema, left; peritonitis, acute diffuse; nephritis, parenchymatous acute.

No. 72, 1918. Clinical Diagnosis: Pneumonia, broncho, bilateral; empyema, bilateral (operated right); probable phlebitis left saphenous vein; pleuropericarditis; probable peritonitis and substernal pus pocket (right); septic arthritis, left hip and left elbow.

Anatomical Diagnosis: Empyema, bilateral; thrombosis of saphenous vein (left); pyemia with involvement of left elbow and abscess below left clavicle; substernal pus pocket, right.

No. 118, 1918. Clinical Diagnosis: Pneumonia, lobar, left, followed by empyema, operated, left; substernal pus pocket, right; pneumonia, broncho, right; peritonitis; possible pericarditis, purulent acute; nephritis parenchymatous acute.

Anatomical Diagnosis: Atelectasis and edema of left lung; walled-off empyema, left; early pneumonia of lower lobe, right; peritonitis, suppurative acute; nephritis, subacute, in slightly contracted kidneys; sacral decubitus; fatty degeneration of myocardium and liver; hyperplasia of spleen.

No. 130, 1918. Clinical Diagnosis: Empyema, operated, left; pyopneumothorax, right; pericarditis, plastic acute.

Anatomical Diagnosis: Empyema, left; substernal pus pockets, bilateral (100 c.c. pus in each); empyema, right (600 c.c.); pneumonic consolidation of upper lobe of right lung with multiple abscesses; atelectasis of lower lobe, right; pericarditis, fibrinopurulent early acute; marked parenchymatous nephritis and myocarditis.

No. 139, 1918. Clinical Diagnosis: Pneumonia, lobar, right; empyema, operated, right; pericarditis, plastic acute; pleuritis, plastic left.

Anatomical Diagnosis: Empyema, right; pleuritis obliterative, right; pleuritis fibrinous, left; pericarditis, serofibrinous acute (shaggy heart); degeneration, fatty, of myocardium.

No. 161, 1918. Clinical Diagnosis: Pneumonia, lobar, resolved, right; empyema, operated, right; pericarditis, purulent; peritonitis, purulent, diffuse; nephritis, parenchymatous; probable subdiaphragmatic abscess; toxic myocarditis.

Anatomical Diagnosis: Empyema, right, walled-off, free from pus; empyema, left (500 c.c.); atelectasis of left lung; peritonitis,

fibrinopurulent, acute diffuse; acute toxic splenitis and nephritis (large white kidney); hydropericardium (200 c.c.).

No. 167, 1918. Clinical Diagnosis: Measles; pneumonia, broncho, left; empyema, operated, left; empyema, right; pneumonic infiltration of lower lobe of right lung; possible pericarditis and peritonitis.

Anatomical Diagnosis: Empyema, operated, left; empyema, right, 300 c.c. in three large pockets; peritonitis, fibrinopurulent, diffuse; atelectasis, partial, both lungs; hyperplasia with multiple infarcts of spleen; marked toxic nephritis and myocarditis.

No. 180, 1918. Clinical Diagnosis: Pneumonia, lobar, left; empyema, operated, left; peritonitis.

Anatomical Diagnosis: Empyema, left empty and nearly healed; complete atelectasis of left lung; obliterative pleuritis, left; peritonitis, suppurative, diffuse acute; pleuritis, fibrinopurulent, early acute, right; hypostatic congestion and edema of lungs; nephritis, parenchymatous acute; hyperplasia of spleen; degeneration, fatty of liver; cloudy swelling and fatty degeneration of myocardium.

No. 187, 1918. Clinical Diagnosis: Tonsillitis, follicular, acute; pleurisy, fibrinous, acute, right; empyema, operated, right; parenchymatous nephritis.

Anatomical Diagnosis: Empyema, right; pleuritis, fibrous, obliterative, right; atelectasis of middle and lower lobes of right lung; nephritis, parenchymatous chronic (large red kidneys); hypertrophy and dilatation of heart with marked fatty degeneration of myocardium.

No. 193, 1918. Clinical Diagnosis: Scarlet fever; pneumonia, lobar, left; pyopneumothorax, operated, left; pneumonia, lobar, right; nephritis, parenchymatous chronic; toxic myocarditis.

Anatomical Diagnosis: Empyema, left, drained empty; pleuritis, fibrous, chronic left and right; atelectasis, complete, left lung; nephritis, parenchymatous chronic with acute exacerbation; multiple minute petechial hemorrhages of all serous surfaces; edema of mesentery and retroperitoneal tissues; degeneration, fatty, marked, of myocardium; fibrous perisplenitis and localized peritonitis; congestion, chronic, passive, of liver.

No. 194, 1918. Clinical Diagnosis: Pneumonia, lobar, left; empyema, operated, left; nephritis, parenchymatous; myocarditis, toxic.

Anatomical Diagnosis: Pneumonia, unresolved, of entire left lung with abscess formation; empyema, left, empty; pleuritis, fibrous, left; nephritis, parenchymatous chronic, with acute exacerbation; degeneration, fatty, with toxic softening of myocardium; degeneration, fatty, with passive congestion of liver; hyperplasia, chronic, with passive congestion and pericapsular fibrosis of spleen; edema of retroperitoneal tissues.

No. 195, 1918. Clinical Diagnosis: Scarlet fever; pneumonia,

lobar, right; empyema, operated, right; myocarditis, toxic; nephritis, parenchymatous, chronic.

Anatomical Diagnosis: Healing, empyema, right; pleuritis, fibrous, right; atelectasis and atrophy of right lung; nephritis, parenchymatous, chronic; marked toxic softening and fatty degeneration of myocardium with hypertrophy and dilatation; chronic hyperplasia of spleen; degeneration, fatty, of liver; cholelithiasis

No. 200, 1918. Clinical Diagnosis: Pneumonia, lobar, left; nephritis, parenchymatous (scarlet fever); empyema, operated, left; valvular heart disease (mitral regurgitation).

Anatomical Diagnosis: Tuberculosis, fibrocaseous miliary, of left lung; pleuritis, obliterative fibrous and tuberculous left; empyema, left, empty; pleuritis, serous, right (300 c.c.); nephritis, parenchymatous, chronic; degeneration, fatty, with toxic softening and dilatation of heart; edema and passive congestion of omentum, mesentery and retroperitoneal tissue with hemorrhage into small bowel and into stomach (slight).

No. 218, 1918. Clinical Diagnosis: Pneumonia, lobar, right lower; empyema, operated right; nephritis parenchymatous, acute.[14]

Anatomical Diagnosis: Atelectasis complete, right lung; edema of left lung; old fibrous pleurisy over external surface of right lung; subcutaneous ecchymoses over right side of body; subserous ecchymoses of pericardium, left pleura and peritoneum; serohemorrhagic effusions in the pericardial and left pleural cavities (700 c.c.).

THIRD SERIES EMPYEMA, NECROPSY ABSTRACTS.

No. 279, 1918. Clinical Diagnosis: Pneumonia, lobar, left; empyema, operated, left; probable pericarditis, purulent acute.

Anatomical Diagnosis: Pneumonia, lobar, left, with collapse of lung; empyema, drainage, left; pericarditis, seropurulent acute (1000 c.c.); emphysema of cellular tissue in anterior mediastinum; nephritis, parenchymatous acute, on chronic, left; nephritis, parenchymatous acute, right.

Bacteriological Findings: Left lung (blood-agar), pneumococci; heart's blood (broth), pneumococci; pericardial fluid (broth), pneumococci; pus from kidney, pneumococci.

No. 282, 1918. Clinical Diagnosis: Pneumonia, lobar, bilateral; empyema, bilateral (operated left).

Anatomical Diagnosis: Pneumonia, lobar, left and lower lobe of right lung; pneumonia, broncho, upper and middle lobes of right lung; empyema, left, with collapse of lung and pleuritis, fibrino-

[14] This patient died with clinical manifestations of uremia due to almost complete suppression of urine for three days before death. No mention was made of nephritis in the anatomic diagnosis but the kidneys were described in the necropsy report as follows: "The kidneys are not enlarged, the capsule comes away leaving a smooth surface which is pale and has a somewhat yellowish cast on section. The cortex is not enlarged and has homogeneous pinkish yellow color. Malphigian bodies are not well seen."

purulent acute; nephritis, parenchymatous acute; peritonitis adhesive, chronic; venous congestion, fatty degeneration and cloudy swelling of liver.

Bacteriological Findings: Pleural fluid, Streptococcus hemolyticus; pericardial fluid, Streptococcus hemolyticus.

No. 284, 1918. Clinical Diagnosis: Pneumonia, lobar, lower, left; empyema operated, left.

Anatomical Diagnosis: Empyema, left, with adhesive pleuritis, diaphragmatic bilateral; edema of lungs, bilateral; bronchitis and bronchiolitis purulent, left; cloudy swelling of liver and kidneys; nephritis, parenchymatous chronic, slight, of right kidney.

Bacteriological Findings: Lung (broth), pneumococcus; pleural fluid, pneumococcus and Streptococcus hemolyticus.

No. 294, 1918. Clinical Diagnosis: Influenza; pneumonia, lobar, bilateral; empyema, operated, left; empyema, right; pericarditis, fibrinous, acute.

Anatomical Diagnosis: Pneumonia, lobar, of entire right lung, lower lobe of left lung, lower margin of upper lobe of left lung; empyema, drainage, left; pleuritis fibrinoplastic and purulent bilateral; pericarditis fibrinoplastic and purulent; nephritis, parenchymatous, acute.

Bacteriological Findings: Pericardial fluid (blood-agar), pneumococcus; pericardial fluid (broth), pneumococcus; lung (blood-agar), pneumococcus; pleural exudate (broth), pneumococcus; pleural exudate (blood-agar), pneumococcus; heart's blood (broth), pneumococcus; heart's blood (blood-agar), pneumococcus.

No. 297, 1918. Clinical Diagnosis: Influenza; measles; bronchopneumonia; empyema, operated, left; nephritis, parenchymatous, acute.

Anatomical Diagnosis: Pneumonia, lobar, of lower left and middle and lower right; pneumonia, broncho, of upper left and upper right; purulent bronchitis; empyema, left; nephritis, parenchymatous, acute; cloudy swelling and fatty changes in liver; septic spleen.

Bacteriological Findings: Heart's blood, pneumococcus; lung, pneumococcus.

No. 298, 1918. Clinical Diagnosis: Pneumonia, lobar, lower left and middle and upper right; empyema, operated, left.

Anatomical Diagnosis: Pneumonia, broncho, lower right; pneumonia, lobar, upper right and entire left lung; empyema, left; pericarditis, fibrinopurulent, acute (500 c.c.); nephritis, parenchymatous, chronic.

Bacteriological Findings: Heart's blood, pneumococcus; lung, pneumococcus.

No. 12, 1919. Clinical Diagnosis: Influenza; pneumonia, broncho; empyema, operated, left; meningitis, acute (Streptococcus hemolyticus).

Anatomical Diagnosis: Empyema, left, practically healed; pleuritis obliterative, left; meningitis, basilar, fibrinoplastic and purulent; leptomeningitis of entire surface of cerebrum; empyema of all ventricles of brain.

Bacteriological Findings: Meningeal exudate, lateral ventricles, Streptococcus hemolyticus; spinal fluid cultures, Streptococcus hemolyticus.

COMPLICATIONS SUBSEQUENT TO OPERATION.

The complications subsequent to operation as disclosed at necropsy in these forty-eight patients are given in Table 24.

TABLE XXIV.

	First series, necropsies, 27. Per cent.	Second series, necropsies, 14. Per cent.	Third series, necropsies, 7. Per cent.
Nephritis	40.7	85.7	85.7
Pericarditis	29.6	21.4	57.1
Peritonitis	25.9	42.8	14.2
Substernal pus pockets	18.5	14.3	0.0
Lung abscess	18.5	14.3	0.0
Empyema bilateral	22.2	28.6	14.2
Endocarditis	14.8	0.0	0.0
Meningitis (metastatic)	0.0	0.0	14.2
Pneumonia of both sides	25.9	28.5	57.1

In Table 25 is given the findings in 100 patients, with empyema, who came to necropsy without operation between November, 1917, and January 25, 1919. Many of these patients died while the pneumonic process was active and were not considered suitable risks for any kind of operation except aspiration.

TABLE XXV.—NECROPSY FINDINGS IN ONE HUNDRED EMPYEMA PATIENTS UPON WHOM OPERATION WAS NOT PERFORMED.

	Per cent.
Nephritis, parenchymatous acute diffuse or exacerbation of chronic	47
Pericarditis, serofibrinous or purulent	46
Pneumonia active in both lungs	45
Empyema, bilateral	19
Abscess of lung	15
Peritonitis, metastatic diffuse purulent	13
Substernal pus pockets	11
Endocarditis, ulcerative or vegetative acute	3
Tuberculosis, pulmonary active	3
Meningitis, subacute basilar	3

Nephritis. In 85.7 per cent. of 21 patients who died subsequent to the operations of the second and third series, nephritis was found at necropsy. In a considerable number of these patients scarlet fever had immediately preceded the pneumonia and empyema. The nephritis was usually of the acute parenchymatous or diffuse

form. In a few an acute exacerbation of a chronic diffuse nephritis had occurred. Pneumonia with empyema following scarlet fever carried with it a much more serious prognosis than pneumonia and empyema without this immediately preceding acute disease. The urinary output and analysis should be carefully watched in every empyema patient. The acute sepsis has not produced either in the 48 necropsies upon patients who had been operated for empyema or in the 100 necropsies upon patients who died without operation the picture of amyloid kidney in any case. Bilateral empyema was present in 30 per cent. of 23 instances of nephritis in the operated patients of the first and second series.

Pericarditis. Pericarditis, seropurulent or purulent, occurred in 36 per cent. of 48 patients who came to necropsy subsequent to empyema operations. It occurred in 46 per cent. of 100 patients with non-operated empyema who came to necrospy. In many patients the occurrence of a to-and-fro pericardial friction rub could be detected prior to the widened area of heart dulness and the more distant heart tones due to effusion. Such an occurrence was of serious prognostic significance in a patient with empyema (Fig. 1).

The diagnosis of purulent pericarditis is attended with great difficulty. I have repeatedly seen at necropsy the normal amount of pericardial fluid replaced with thin fibrinopurulent fluid, or, if the process had existed for twelve to fourteen days, as judged by the clinical history, fibrin organization had taken place, with firm enveloping adhesions, between the pericardium and myocardium and the typical picture of the so-called "shaggy heart." In many such patients the area of heart dulness was not increased either by percussion or the roentgenogram, since distention of the pericardium had not taken place. There had merely been a change from a serous to a fibrinopurulent fluid in the pericardium. Any earlier friction rub which may have been transitory was with difficulty differentiated from a pleuropericardial rub in a patient with rapid respirations, due to pneumonia, an empyema or a pneumothorax. The distant heart tones present in hydropericardium could not be relied upon in the diagnosis of those instances of purulent pericarditis in which the fluid was not greatly increased in amount. A left-sided closed pneumothorax also so muffled the heart tones in numerous instances as to lead to a suspicion of pericarditis, with effusion, when such a condition did not exist.

Paracentesis of the pericardium for the relief of effusion, if carefully performed, involves little risk. It should be mentioned, however, that in only one patient was the procedure of any avail in contributing to recovery. In diagnostic and prognostic importance the procedure was of value.

In the 27 necropsies which followed the first series of empyema operations, 4 instances of pericarditis followed an empyema of the

left side, 3 followed empyema of the right side, while in 1 the empyema was bilateral.

In the 14 necropsies which followed the second series of empyema operations, 1 instance of pericarditis followed empyema of the right side while in 2 instances the empyema was bilateral.

In the 7 necropsies which followed the third series of empyema operations, 3 instances followed empyema of the left side while in 1 instance the empyema was bilateral. To recapitulate, in 15 patients, pericarditis, usually purulent, developed in 7 instances when the empyema was on the left side, in 4 instances when the empyema was on the right side and in 4 instances when the empyema was bilateral. The occurrence of pericarditis bears an undoubted relationship to the presence of substernal pus pockets (*vide infra*).

FIG. 1.—Encapsulated empyema, left, with pericardial effusion. Oper. Series II, No. 3. Recovery.

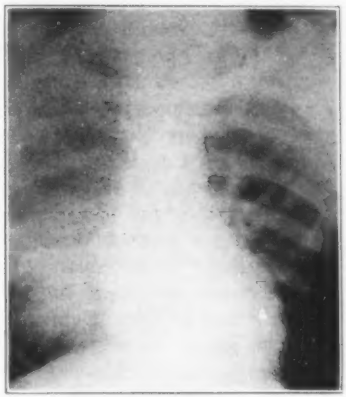

FIG. 2.—Abscess of lung, right, with bronchial drainage. Probable tuberculosis, left. Recovery.

Substernal Pus Pockets. The occurrence of this serious complication apparently varied with the type of pneumonia. It was more commonly noted subsequent to the type of interstitial pneumonia which followed measles and the empyemas constituting the first series of operations (18.5 per cent. of 27 necropsies). It also was encountered in 14.3 per cent. of the instances of empyema necropsies of the second series, which likewise occurred subsequent to an epidemic of streptococcus pneumonia, in which many interstitial types of pneumonia were encountered. In the third series of empyema necropsies (following influenzal pneumonia) this complication was not encountered and but few instances of the interstitial types of pneumonia occurred. Substernal pus pockets appeared to be an infrequent complication except in the interstitial types of

streptococcus pneumonia. We[15] have believed that the spread of the infection to this locality occurred by way of the lymphatic channels of the parietal pleura to the chain of substernal lymph nodes immediately beneath the sternum and which were not directly connected with the anterior mediastinum. The situation of these pus pockets apparently made infection of the pericardium more liable to occur by contiguity.

Peritonitis. Peritonitis, serofibrinous or purulent diffuse, occurred in 14 of the 48 necropsies (29.2 per cent.), constituting the patients with operated empyema in the three series; in 5 the empyema was bilateral, in 5 the empyema occurred on the left side, while in 4 the empyema occurred on the right side. Extension had occurred through the diaphragm in all but 1 of the cases. In 1 patient a postoperative pneumonia and empyema followed appendectomy, with peritonitis. In but 1 instance did verified peritonitis occur without empyema.

Bilateral Empyema. Bilateral empyema was found in 11, or 22.9 per cent., of 48 patients who came to necropsy in the three series of empyema operations. In the majority of patients in which this occurred there had been pneumonia affecting both lungs.

Bilateral Pneumonia. Bilateral pneumonia was found in 15, or 31.2 per cent., of 48 patients who came to necropsy in the three series of empyema operations. In a considerable additional number of cases the lung on the opposite side was collapsed or markedly edematous. In others an obliterative fibrous pleuritis was present on the side opposite to the operated empyema. This had occurred as a sequel to fibrinous pleuritis accompanying the earlier bilateral pneumonia.

Lung Abscess. Abscess of the lung was found in 7, or 14.6 per cent., of 48 patients upon whom necropsy was performed in the three series of empyema operations. In 5, or 71.4 per cent., of these the abscesses were multiple and occurred on the affected side. Necrosis of lung sufficient to produce considerable intrapleural hemorrhage occurred in one patient (Fig. 2).

Other Complications. Less frequent conditions found at necropsy in the three series of empyema operations were tuberculosis, pulmonary fibrocaseous or miliary; metastatic meningitis; endocarditis; hydropericardium; embolism and thrombosis of mesenteric vessels; myocardial degeneration. The myocardial softening differed in no essential particular from that degree of parenchymatous degeneration affecting all organs in the presence of a chronic septic process. Ascites as a result of myocardial degeneration and nephritis occurred in one instance.

Diagnosis. A pleural effusion or empyema should be suspected in every pneumonia patient whose respiration early in the disease

[15] Stone, W. J., Phillips, B. G., and Bliss, W. P.: Arch. Int. Med., 1918, xxii, 409.

shows embarrassment, especially if associated with a pleural friction rub and pulse-rate out of relative proportion to the fever. The occurrence of severe pleural pain with an expiratory grunt was always suggestive of pleural effusion twenty-four hours later. The aspirating needle should be used early, the points selected being over the areas of greatest dulness. Care should be exercised in the cautious insertion of the needle to avoid pneumothorax from puncture of the lungs (manifested usually by bright blood upon aspiration). The danger of a closed pneumothorax accidentally produced in this manner has probably been overestimated, but its occurrence should, of course, be avoided if possible. The glass syringe should be preferably attached to the needle by a short (two-inch) connection of rubber tubing with fairly heavy wall. In case it was neces-

FIG. 3.—Resolving pneumonia on right side, with walled-off fluid in outer portion. Note the high diaphragm. Oper. Series III, No. 55. Recovery.

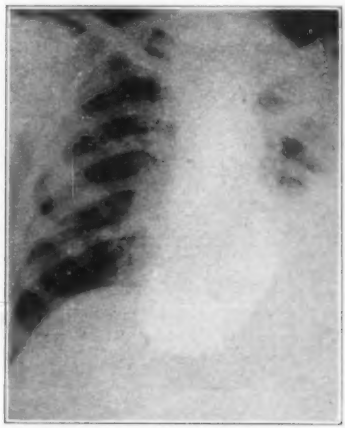

FIG. 4.—Resolving pneumonia, right. Thickened pleura, resolving pneumonia and fluid at base, left.

sary to disconnect the syringe during aspiration, following an exploratory puncture, the rubber tubing was clamped to prevent entrance of air. The physical signs of fluid in many instances were untrustworthy. More distant breath sounds replacing the close-to-the-ear tubular breathing, the abolition of whispered voice transmission, decreased vocal and tactile fremitus and respiratory lagging of the affected side were the essential physical signs. Dulness on percussion was the most important single sign. With quantities of fluid up to 200 c.c., vocal or tactile fremitus and the transmission of whispered voice might still occur if a portion of consolidated lung occupied a position between the fluid and the chest wall. In bilateral empyema, as in acute emphysema, the type of breathing was abdominal rather than costal.

In performing paracentesis it was found wise to remember that the diaphragm may be higher than normal on the affected side, due to pleural adhesions. Roentgenograms of the chest were of great help in localizing small accumulations of fluid, interlobar empyema or pockets of pus in unusual locations, such as near the apex of the lung. The roentgenogram was of little help in the diagnosis of substernal pus pockets. Greater dependence should always be placed upon the history of the clinical course, the physical signs and the aspirating needle. So-called unresolved pneumonia does occasionally occur as a cause of delayed convalescence. When it does occur the cause is usually to be found in a localized empyema. Empyema of the pleural cavity developed very rapidly in certain types of pneumonia in which a hemolytic streptococcus was present as an asso-

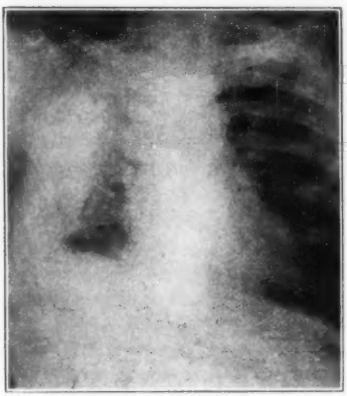

FIG. 5.—Walled-off empyema, right, anterolateral portion of chest. Note the high diaphragm.

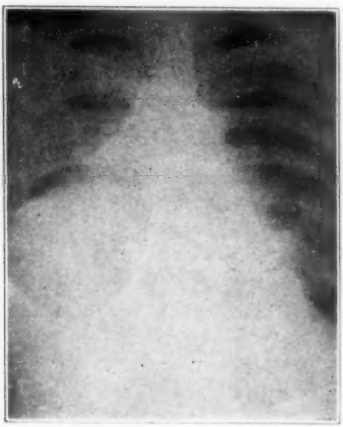

FIG. 6.—Empyema, right, pleural cavity, extending to height of third rib in front. Oper. Series II, No. 38.

ciated infection. This was especially true of the pneumonia following measles, scarlet fever and influenza. The question was very frequently raised in our minds as to the occurrence of a primary pleuritis in these patients. Cyanosis in such patients was usually an early feature. The pathological process was so extensive, the exudation so rapid, as a result of the widespread fibrinous pleuritis, that little could be done, except repeated aspirations, for these unfortunate patients.

Later in the course of what has many times appeared to be an uncomplicated pneumonia, if the fever persisted, the pulse-rate elevated and the respirations were increased an encapsulated empyema was located. If one recalled to mind the five most common complications as a cause of death in pneumonia which had

progressed beyond the acute stage, diagnosis of the cause of death was much facilitated. These were:

1. Empyema with possible peritonitis.
2. Spread of pneumonia to the opposite side.
3. Pericarditis, serofibrinous or purulent.
4. Nephritis.
5. Substernal pus pockets (in the interstitial types of streptococcic pneumonia following measles and scarlet fever) and lung abscess.

TREATMENT. In performing the repeated aspirations one may expect the fever, pulse-rate and many times the respiratory embarrassment to diminish. We have been guided by four points in deciding upon the proper time for operation in a unilateral empyema: (1) the quantity and character of the pus; (2) the type of infection;

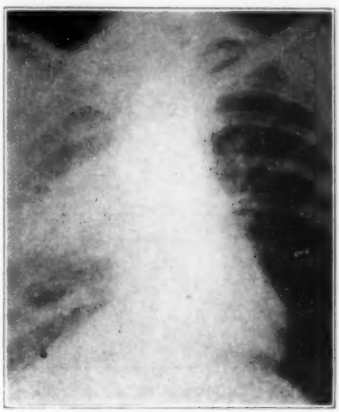

FIG. 7.—Resolving pneumonia, with opaque area, due to interlobar empyema, right side.

FIG. 8.—Localized empyema of right apex.

(3) the presence or absence of complications; (4) the length of time necessary to show improvement in the general condition of the patient under the aspirations. It will be noticed in Table 15 that an average of six aspirations were performed and that the average was about nineteen days before operation for the patients of the second series. In Table 21 it will be noticed that the average number of aspirations was 3.7 and that the interval before operation was 13.5 days for the patients of the third series. In individual patients the average length of time before operation in the second series was longer than may have been necessary. It is probable that the high mortality of the first series had made us unduly conservative.

The time for operation will in general depend upon the four factors mentioned above. Five aspirations during a period of twelve to

fourteen days, if the patient has shown improvement, will constitute an average. Operation may, with greater safety, be longer postponed upon a patient with pneumococcus than streptococcus infection. The older teaching that a pneumococcus empyema would recover by aspiration should be revised. In the 35 patients who recovered by aspiration alone a pneumococcus empyema was present in 9, or 25.7 per cent. One of the patients who recovered without operation had bilateral empyema due to pneumococcus infection. A total of nineteen aspirations were performed upon him, with recovery; 35, or 11.3 per cent., of the 310 patients here reported, recovered without operation. This closely corresponds with the figures from Camp Lee (13 per cent.) mentioned by Major Graham and Captain Bell.[16] It is probable that our records of the aspirated

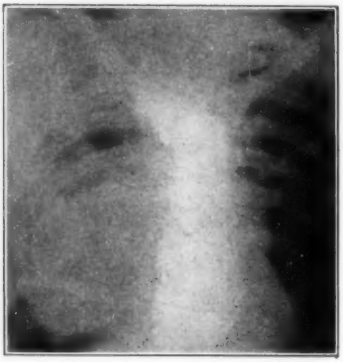

FIG. 9.—Encapsulated empyema, right, ten days after drainage operation. Oper. Series III, No. 53. Recovery.

FIG. 10.—Empyema, right, with displacement of heart to left. Note shadow in median line, due to probable substernal pus pocket. Oper. Series III, No. 26. Recovery.

recoveries are incomplete, since many patients recovered from whom pus was aspirated in small quantity upon one or two occasions, of whom no record of empyema was kept for the purpose of this study.

In performing the aspirations, when the pus was thick and because of some complication such as an active pneumonia on the opposite side or a bilateral empyema, operation did not at the time appear advisable, intrapleural lavage, using sterile saline solution, was performed at the time of aspirations in order to dilute the pus and permit of its aspiration. The apparatus consisted of a Potain aspirator, the rubber tubing from which connected with one arm of a three-way stopcock, to another arm of the stopcock was attached a portion

[16] AM. JOUR. MED. SC., 1918, clvi, 839.

of rubber tubing and the aspirating needle, while to the third arm was connected a portion of rubber tubing with a bottle containing the warm saline solution. Through the rubber cork of this bottle a glass connection was attached to a rubber bulb, pressure of which forced the saline solution from the bottle through the tubing. After the aspirating needle was inserted as much pus as could be aspirated flowed into the bottle. The stopcock was then turned so as to connect with the bottle containing the saline solution. By pressure on the bulb, saline solution in quantities of 200 to 300 c.c. was forced through the aspirating needle into the chest cavity. The stopcock was again turned and the diluted pus aspirated into the vacuum bottle. In this manner quantities of pus varying in amounts from 400 to 800 c.c. could be removed in excess of the amount secured by the first aspiration and in excess of the amount of saline solution introduced.

At the time of operation the patient received hypodermically one-eighth grain of morphin and one-two-hundredth grain of hyoscin one hour before going to the operating room. This was repeated one-half hour before the operation, except in markedly weakened patients. General ether anesthesia has been proved safe for these patients in the absence of an active pneumonic process and upon whom a number of aspirations have been performed. This was especially true if after the ether anesthetic the lungs were thoroughly ventilated of ether vapor by oxygen inhalation with the closed cone for about five minutes. Recovery from the anesthetic occurred rapidly and no ill effects from the ether were evident subsequently. Except for a few of the patients in the first series, empyema cases have remained in special wards of the pneumonia sections under the care of the medical service. They have been operated, by a surgeon assigned for this duty, by the chief of the surgical service, in special operating rooms of the pneumonia sections, which rooms were also used for the daily dressings. The aspirations were performed by the medical officers who cared for the patients during their attack of pneumonia. Since the causes of death subsequent to operation were those resulting from medical complications, the patients remained under the care of the officers of the medical service who had been familiar with the course of the illness from the time of its onset.

The attempt was made at the time of operation to secure copious drainage for the first forty-eight hours by means of a single large drainage tube (about four inches long and three-quarter-inch inside diameter), after which, in many patients, the modified Brewer tube, with Ewald suction bulb and Carrell tube for irrigation, shown in Fig. 11, was inserted. The skin opening should not be much longer (about two inches) than the width of the flange on the Brewer tube. While this small incision made it more difficult for the operator to resect one-inch of rib, it was possible to fit the Brewer

tube tighter and better negative pressure by the suction of the Ewald bulb could be secured. At the present time no irrigation is used for the first forty-eight hours. At the end of that period irrigation is carried out by means of the apparatus as shown in Fig. 12. Neutral solution of chlorinated soda in quantities of 100 to 300 c.c., depending upon the size of the cavity, was allowed to flow in or was injected by means of a hand syringe, every two hours. Suction was

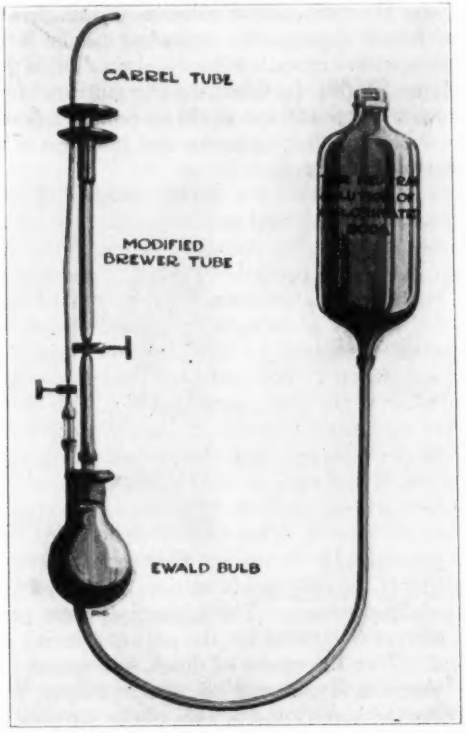

FIG. 11.—Apparatus for continuous or interrupted empyema irrigation and suction as used at U. S. Army Base Hospital, Fort Riley, Kansas.

secured at the end of two hours to remove the solution and pus before the fresh solution was placed in the cavity. At the end of the first week suction was more or less continuously employed and one daily irrigation in the dressing room substituted for the continuous irrigation in the wards. Pain contra-indicated suction. Irrigation with the neutral solution of chlorinated soda was contra-indicated if a communication with a bronchus was suspected. It has not been necessary to have any extensive secondary operation performed for

large open pneumothorax or cavity in any of these patients, although sequestrectomy for a small portion of necrotic rib and dissection of the sinus was necessary in a few patients.

The daily irrigations were, as a rule, continued until pus was absent. The Brewer tube was removed after two weeks and gradually decreasing sizes of plain rubber tubing substituted for drainage purposes. The count of the number of bacterial cells per field from smears of the discharge as an index to the efficiency of the irrigation has given in our hands no more definite information as to the safe time for closure of these wounds than the clinical evidences. As

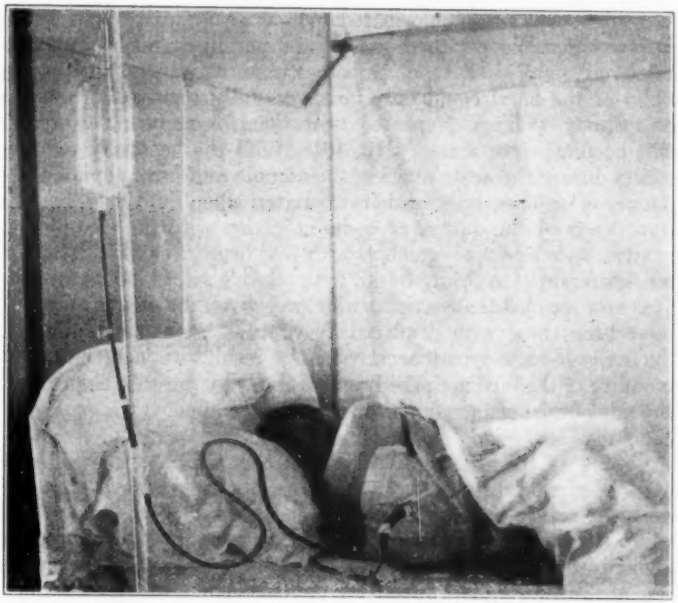

FIG. 12.—Apparatus in position for irrigation and suction in empyema.

the size of the opening of the pneumothorax diminished the lung was able to resume expansion. The ability of the lung on the affected side to expand determined to large degree the extent of drainage and the obliteration of the empyema cavity. Posture in bed and suction assisted drainage, but drainage was greatly facilitated if expansion of the lung could occur. The external opening should therefore be decreased in size as rapidly as possible by substituting smaller-sized tubes sufficiently large for drainage and irrigation.

The postoperative dressings required rigid surgical cleanliness to prevent secondary infection of the pleura, a condition particularly liable to occur. A high calorie diet was used to make up for the

extensive tissue waste which accompanied the chronic sepsis. A diet of 3500 to 4000 calories could be readily secured by augmenting the regular or special diet with carbohydrates and fats.

Trocar drainage of empyema has not been satisfactory in our hands. If used during the course of an active pneumonia for the drainage of thin pus, danger of an open pneumothorax was constantly present if the patient was delirious, and, because of the pain caused by the presence of a metal tube, attempted its forcible removal. If used at a later stage, when the pus had become thickened, the lumen of the cannula was insufficient in size to drain the larger masses of fibrinous exudate so commonly present. The use of neutral solution of chlorinated soda as an irrigating fluid would in many cases liquefy these masses and permit drainage through a relatively small-sized tube. In other cases masses as large as the palm of the hand could only be successfully removed through a costectomy opening. Repeated aspirations for empyema as used in this hospital since January 12, 1918, fulfil the necessary requirements during the acute stage of pneumonia and have obviated the danger of an open pneumothorax. Later, when limiting adhesions have lessened the danger of communication with the free pleural cavity, and have, to greater or lesser degree, immobilized the mediastinum, costectomy could, with relative safety, be performed. It is now recalled that patients who have given the greatest anxiety have been those with displaced heart in an open pneumothorax. Such displacement had occurred as a result, we now know, of mobility of the mediastinum brought about by pressure changes on the side of the open pneumothorax which had affected the expansion capability of the lung on the opposite side.

Because of the interest attached to a comparison of clinical facts and experimental data, those who are interested should read the excellent article by Major Graham and Captain Bell (*loc. cit.*), in which it was shown experimentally that the pressure changes brought about by an open pneumothorax affected not only the lung on the side of the opening but affected in similar degree the opposite lung, due to the mobility of the mediastinal structures. As has been stated by them, the normal thorax may be considered as one cavity instead of two. They have expressed the belief that the dangers of an open pneumothorax are much lessened after adhesions have formed which immobilized the mediastinum. The formation of such adhesions has been favored by the late operation as well as more adequate air space in the lungs resulting from the subsidence of the pneumonia and decreased bronchial exudate.

The bearing of such facts upon the treatment of empyema is obvious, facts which, it is believed, have been verified clinically by the results secured for those patients, here reported, upon whom the late operation had been performed.

The average incapacity from empyema necessitating drainage will

probably be not far from three months. Recovery has in some patients taken place in four to six weeks, but many other patients have required four to six months. Two or three of the patients in the first series had small costal sinuses after one year.

The writer has been under constant obligation to many officers who have earnestly coöperated in this work, especially to Major B. G. Phillips, Captains W. P. Bliss, W. S. Binford, W. M. Stout, C. W. Zugg and J. H. Armstrong, Lieutenants C. L. Morris, A. B. Schwartz, P. S. Murphy, C. S. Mundy, G. F. Zachritz, S. T. Nicholson, Jr., G. M. Purves, W. A. Meierding, H. A. Kirkham, C. L. McLaughlin and A. F. Watts; to Captain E. S. Cummings and Lieut. G. H. Cooper for roentgenographic assistance; to Major O. F. Broman, Captain R. L. Benson and Captain W. Levin of the Laboratory Staff, and to Captain H. W. Cattell, Lieutenants F. K. Bartlett and A. A. Smith for necropsy notes.

SCLERODERMA AND SCLERODACTYLY: REPORT OF A CASE, WITH ROENTGEN RAYS AND REVIEW OF THE LITERATURE.

By Reginald M. Atwater, M.D.,
Boston, Massachusetts.

(From the Medical Clinic of the Peter Bent Brigham Hospital, Boston.)

Cases of scleroderma and sclerodactyly, with roentgen-ray studies of the bony changes, are infrequent enough in the literature to justify the reporting of a case. The case here recorded is that of a Jewish woman, aged fifty years, who entered the medical wards of the Peter Bent Brigham Hospital on December 16, 1918 (Med. No. 10,081), complaining of stiffness of the joints, particularly in the hands, but also generally throughout the body.

The present illness has begun one year previously, with stiffness in the shoulders, which later appeared in the hands and arms and in turn in the back and legs. Four months previous to her entrance she had pain in the neck about the ear, most marked on the left side. She complained of particular difficulty on the left side of the whole body. There was considerable aching pain throughout the affected parts, which was worse at night. During the two weeks preceding entrance the pain had become much worse. Although she refers all the pain to the joints, her difficulty is best described as a general stiffness of the extremities themselves and not wholly as a joint affair. The onset of the thickening in each new spot is preceded by an itching, papular eruption, lasting several days.

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Within the preceding few weeks she had become much weaker and had lost her appetite. She was very miserable and had found no relief in the various treatments which several physicians had advised, consisting of liniments and electrical applications. Except as above, she had developed no new cardiorespiratory, gastro-intestinal, genito-urinary or neuromuscular symptoms during the present illness.

Apart from these symptoms, and quite independent of them, she had developed during the week before entry some cough, with severe headache, backache and increase of her malaise. The onset, course and symptoms corresponded in general to a mild attack of influenza.

Family History. The family history, although incomplete because her home was in Russia, is significant in recording a sister, who when last heard from several years ago was troubled with stiffness of the skin. This sister probably has since died. Her father is living, health unknown. Mother died of an unknown cause at an advanced age. Four brothers and five sisters supposedly are living and well. There is no family history of cancer, diabetes, gout, tuberculosis, arthritis or diseases of the circulatory, respiratory, digestive, renal, nervous or muscular systems.

Marital History. Husband is living and well. Six children are living and well. One child died at one year, cause unknown. There was one miscarriage at five months with the first pregnancy.

Habits. No addiction to tea, coffee, alcohol or drugs.

Occupational History. She has kept house for herself and family since marriage and has worked hard.

Past History. She was born in Russia, coming to America seventeen years ago and never living outside the temperate zone. Although her memory is fair, she could not remember having had chicken-pox, smallpox, measles, mumps, whooping-cough, influenza, chorea, rheumatism, pleurisy, pneumonia, scarlet fever or typhoid fever. No known association with tuberculosis. The patient remembers no other diseases. No injuries or operations.

Head. Headaches have been rather frequent for many years, frontal in type and fairly severe. *Eyes:* Glasses have been worn for reading for many years; no history of failing vision, inflammation or pain. *Ears:* There is no loss of hearing, pain or discharge. *Nose:* There has been a chronic postnasal catarrh without history of frequent head colds, epistaxis or symptoms of obstruction. *Teeth:* Always have been rather poor and neglected, but no positive history of dental abscess was obtainable. *Throat:* There has been occasional tonsillitis, but no history of hoarseness or sore mouth.

Cardiorespiratory. The patient thinks she may have had some edema of the ankles for the past year. No history of pain in the chest, palpitation, dyspnea, cough, sputum, hemoptysis or night-sweats.

Gastro-intestinal. Appetite always has been very poor. Habits of eating are very irregular. Bowels never move without a cathartic. There has been mild distress in the epigastrium after eating. No history of nausea, gas, vomiting, hematemesis, colic, icterus, diarrhea, bloody, tarry, or clay-colored stools or of hemorrhoids.

Genito-urinary. Nocturia once or twice has been present for a number of years. No history of hematuria, pyuria, retention or incontinence is obtained; no satisfactory venereal history is obtainable by name or symptoms.

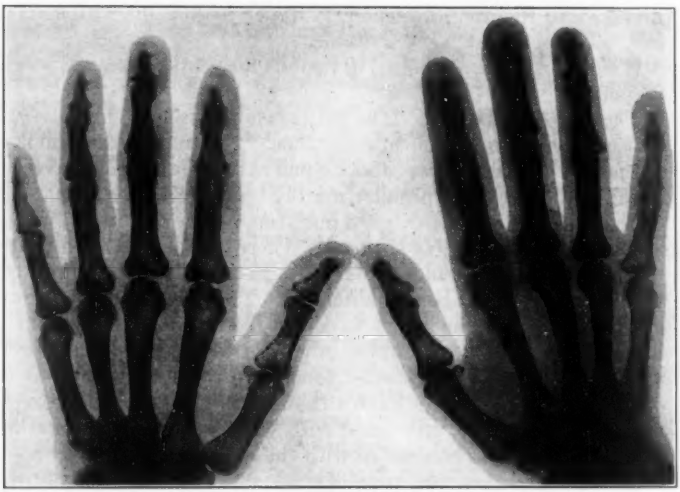
Catamenia. Onset was at eighteen years; have always been quite regular, lasting five days. Last period occurred two years ago, at the age of forty-eight years, without particular symptoms.

Neuromuscular. Sleep has been very poor. She has always been of a nervous disposition, but this has been much accentuated by the present illness. There has been dizziness and occasional fainting and coldness of the extremities, particularly in the present illness. No shooting, muscular, girdle or joint pains. Memory is fair. Temperament very irritable.

Weight. Has been about 110 pounds for years. Present weight 90 pounds.

Physical Examination. The patient shows striking characteristic appearances, recognizable at a distance. The color of the skin is of a generally uniform brown, about equal in tint to that of the average Japanese. There is a peculiar marbly hardness of the skin, associated with a glossy luster, most marked over the face, neck, wrists, ankles and in the small of the back. There is a marked resemblance to the dried skin of a cadaver. There is an expressionless appearance to the face, the lines being obliterated. The hands show moderate general swelling of the fingers as contrasted to the upper half of the hand, along with atrophy of the interossei. The ends of the fingers appear thickened and shortened, much as if they had been chopped off. All of the finger-tips have a thinning of the skin into a parchment-like membrane, associated with some scarring and a marked pallor of the tips as contrasted with the adjacent skin. Over some of the knuckles there are areas of paler skin and along the dorsum of the fingers there is some mottling of the pigment. The skin over the backs of the fingers is smooth. The folds at the joints are less marked than normal. It is almost impossible to pick up a fold of the skin over the fingers or hands. On the palms there is a slight degree of brownish pigmentation. The lines on the palms of the hands are marked and are definitely more pigmented than the adjacent skin. The fingers can be only partly flexed, evidently because of the thickening of the skin, and not due to any change in the joints, as the joints are freely movable on passive motion until checked by the tenseness of the skin. The thickening of the skin is less on the upper arms than below and less on the flexor than on the extensor surfaces. Thermal sense is not disturbed over any portion of the body. This

same type of skin is present over the face and neck and to a less extent over both ankles and feet. The toes in a small way resemble the fingers. One finger-nail is very much thickened, dark in color and irregular. The other finger-nails show slight thickening and linear corrugation. The toe-nails show practically no changes. These features are essentially symmetrical and no areas resembling isolated morphea are found. Otherwise the physical examination shows hair that is somewhat coarse; the mucous membranes are somewhat pale; there is no buccal pigmentation; the teeth are very poor indeed; the neck is stiffly moved because of the inflexible skin of the neck; there are no palpable lymph glands; the lungs show a few medium, sticky rales of the type seen in influenza. Otherwise the chest is normal. The heart findings are negative. The vessels show just a little sclerosis. There is no hypertension. The abdomen, extremities and reflexes are negative.



The urine showed no albumin or sugar in three examinations, but a few hyaline and granular casts and white blood cells were found. The hemoglobin was recorded as 50 per cent. There were 3,400,000 erythrocytes and 8000 to 9000 leukocytes. The differential smear showed polymorphonuclears 66 per cent., small lymphocytes 28 per cent., large mononuclears 5 per cent., and eosinophiles, 1 per cent. The red cells in the smear showed variations parallel to their reduction. The stool examination was negative. The Wassermann reaction on the blood serum was negative.

Roentgen studies of the hands show definite bone atrophy and absence of the tips of the terminal phalanges of the second, third,

fourth and fifth fingers of both hands and partial destruction of the same phalanx of both thumbs. Studies of the skull and the sella showed negative findings. The basal metabolism on December 20 showed findings 1 per cent. above normal.

Histological study of a piece of skin removed from the small of the back in a sclerosed area on December 20 showed a considerably increased thickness of the corium, the connective tissue of which showed dense and, in places, hyaline collagen. The epidermis was of normal thickness and contained in the basal layer more than the average amount of brown pigment. Immediately beneath the epidermis the connective tissue was of much more delicate structure. The collagen bundles were small, loose textured and there were occasional apparently active fibroblasts. The coil glands were normal. There were a few normal-appearing hair follicles in the specimen. The subcutaneous fat was normal in appearance. The connective-tissue septa between the fat lobules were somewhat heavier than normal. There were small arteries, veins and nerves in the specimen, all of which had a normal histology.

The patient remained on the ward for one week, during which time she had an essentially normal temperature and respiration rate. The pulse-rate varied between 80 and 130 without obvious cause. The signs suggesting influenza cleared up without further event. She developed an eruption, said to be similar to that usually preceding the thickening, over one eyebrow, where there was very slight involvement of the skin. This eruption consisted of a very few scattered papules of a pink color on a slightly reddened base, which showed scaling for several days. Attempts at relief of the symptoms by hot baths and massage were not successful subjectively. She was given thyroid extract in doses of from 0.065 to 0.13 gram and was advised to continue on the smaller dose three times a day. She left the hospital without any signs of improvement. After two months of the thyroid therapy it is stated: "It does not do her any good; in fact, she feels worse than ever. Her legs and arms are stiffer than formerly and she is very weak. She is starving herself."

A search of the available literature covering the features of the sclerodactyly as shown in this case has produced about 15 reported cases in which particular mention and study have been made of the sclerodactylism. Of course, this is a small portion of the total of scleroderma cases, many of which have been complicated by sclerodactyly. The sclerodactyly is often considered as characteristic of one form of scleroderma—the diffuse, symmetrical, atrophic type. Thirty-four years ago Lewin and Heller[1] collected 500 cases of scleroderma, and since that time many cases have been recorded.

So far as can be ascertained the first radiographic study of this process is that noted by Fordyce[2] in 1907. During the same year

[1] Die Sclerodermie, Berlin, 1885.
[2] Case of Sclerodactylitis, Jour. Cut. Dis., 1907, xxv, 90.

Pollitzer[3] and Fox[4] each published cases with very similar roentgen-ray findings. Subsequent reports by Jamieson,[5] Weber,[6 7 8] Stowers,[9] and Bertolotti[10] are essentially the same. All showed deformity, atrophy or disappearance of the terminal phalanges in the hands. The joints seem to be rarely involved.

This process in the bones is practically limited in the reported cases to the terminal phalanges of the hands, and, much less frequently, of the feet also. The proportion of hand-and-foot involvement seems to bear a general parallelism to the relative frequency of the sclerodermic changes in the hands and feet. In Osler's series[11] Case XIV showed bone atrophy in all the bones of the left upper extremity, including the scapula. One of Weber's cases[7] showed marked atrophic changes in the bones of the face, over which there was an extensive scleroderma. In none of these cases of sclerodactylism was the scleroderma of the patchy morphea type. There seems to be a doubtful relation between the process in the skin and that in the bone. Though both are essentially atrophic they appear to be quite independent of each other. (Olsen.[12])

Cases are reported in age from a case (Cockayne[13]) one year old, which had an antenatal origin to cases more commonly in the fifth and sixth decades. The predominance of the Jewish race in this series of cases, as in all of scleroderma, is very striking and also the frequent associated symptoms of Raynaud's disease and arteritis obliterans.[4 6 7 8 14] One case is reported associated with past and family history of angioneurotic edema by Savill.[15]

Pollitzer[16] reports ossification in the skin and Olsen[12] reports the finding of calcareous concretions in the skin of scleroderma.

Fox[17] in a review of the sclerodactyly type of scleroderma finds a distinctly decreased glucose tolerance.

[3] Sclerodactylia, Jour. Cut. Dis., 1907, xxv, 280.

[4] Two Cases of Raynaud's Disease with Ocular Symptoms; One Case Complicated by Scleroderma, Jour. Cut. Dis., 1907, xxv, 337.

[5] Generalized Scleroderma with Sclerodactylia, Med. Jour. Australia, 1917, ed. I, p. 505.

[6] Two Cases of Sclerodactylia, British Jour. Dermatol., 1915.

[7] Case of Generalized Atrophic Sclerodermia with Sclerodactylia, Proc. Roy. Soc. Med., 1915, Dermat. Sect., part I, viii, 126.

[8] Sclerodactylia of Feet Associated with Arteries Obliterans and Gangrene of Toes, Proc. Roy. Soc. Med., 1915, Clin. Sect., part I, viii, 52.

[9] Note in article of Weber (7).

[10] Etude radiologique d'un cas de sclerodermie. Analogies de la sclerodermie avec la syndrome de Profichet, N. Iconog. de la Salpêtrière, 1913, xxvi, 291.

[11] Osler and McCrae's Modern Medicine, iv, 1016.

[12] Sclerodactyly with Calcareous Concretions, Jour. Cut. Dis., 1917, xxv, 96.

[13] Sclerodermia with Sclerodactylia of Anatomical Origin in an Infant, Proc. Roy. Soc. Med., 1915, Sect. Dis. Child., part I, viii, 72.

[14] Rolleston, H. D. and Carpenter, G. D. H.: Sclerodermia with Sclerodactyly, Proc. Roy. Soc. Med., 1910, Clin. Sect., part I, iii, 32.

[15] Case of Scleroderma of the Extremities with Angioneurotic Edema, Proc. Roy. Soc. Med., 1909, Clin. Sect., part I, ii, 200.

[16] Ossification in the Skin in a Case of Sclerodermia, Jour. Cut. Dis., 1918, xxxvi, 271.

[17] Case of Scleroderma (Sclerodactyly Type), Jour. Cut. Dis., 1917, vol. xxxv; Tr. New York Dermat. Soc., May, 1916, p. 43.

A previous assertion of the relation of scleroderma with syphilis would appear to be set aside by the high percentage of negative Wassermann reactions in this group.[18]

In summary this case of scleroderma possesses many features very characteristic of the disease in its usual form. The associated sclerodactyly appears quite typical of those cases previously reported in which radiographic studies of the bones have been made. There is a characteristic atrophy, absorption and eventual disappearance of the terminal phalanges most commonly in the hands and sometimes in the feet.

NEUROCIRCULATORY ASTHENIA (SOLDIERS' HEART).

By John H. Carroll, Major, M.C., U.S.A.,

MEMBER OF THE TRENCH FEVER WORKING PARTY, ROYAL ARMY MEDICAL COLLEGE, LONDON.

If one may judge from the literature on soldiers' heart, this syndrome, the original description of which we owe to Da Costa, has been the most studied of the diseases of the war. The English school of MacKenzie and Lewis early recognized the functional basis of the syndrome and did much to rob the disease of the great terror and fear of impending dissolution with which the lay victims contemplated it. It redounds much to the credit of the school of clinical observation, of which MacKenzie is the great exponent, as opposed to that of abstract scientific analysis, that the tachycardia, breathlessness, murmurs, etc., were not considered in those days indicative of organic changes in the heart. Although definite progress in the treatment of some variety of these conditions has been achieved by the Lewis school, there is no agreement, in our opinion, either in the etiological factors concerned in the causation or the pathogenesis of the syndrome. When the reports on soldiers' heart in the American draft army became available, two very striking facts were apparent:

1. That this condition was not an uncommon symptom-complex of civilian youths, much intensified by the conditions attending the early stages of the draft.

2. That the etiology of these cases did not altogether agree with the etiological factors believed to be responsible for the cases developing on active service.

In reviewing the literature on soldiers' heart, we are forced to ask the question, "Have we quite exhausted, in our analysis of the

[18] Osler, Wm.: On Diffuse Scleroderma with Reference to Diagnosis and Use of Thyroid Gland Extract, Jour. Cut. Dis., 1898, xvi, 49 and 127.

symptomatology of soldiers' heart, the possibilities in pathogenesis and their relation to the etiological factors believed to be the cause of the condition?" We believe not.

Sir James Barr, from 1916, gave us in the literature what he considered sufficient facts to establish the entity of soldiers' heart as hyperthyroidism.

Harlow Brooks, from his study, concluded that the condition was one of hyperthyroidism. Robey and Boas believed the cause to be "a fundamental instability of the patient, that cannot be cured." McFarlane found his group of men had been subjected for many years to a low-grade infection.

Lewis considers infection the predominant etiological factor in the syndrome.

From this array of opinion we are offered three etiological factors: (1) hyperthyroidism, (2) constitutional instability, (3) infection; and we propose to attempt an analysis of these factors in relation to what we believe to be the pathogenesis of the disease.

That the disease was hyperthyroidism is a theory which comes to us supported by such sound clinical judgment as Harlow Brooks in America and Sir James Barr in England, both of whom described in the picture palpable thyroid enlargement as well as the clinical phenomena common to hyperthyroidism. Many other observers agree with this view. Lewis and his school dispose of the theory of hyperthyroidism after failure to demonstrate a more or less constant palpable thyroid enlargement. We believe this inadequate ground for dismissal of the theory: (1) because the personal factor in deciding the presence or absence of thyroid enlargement is a very considerable one, and (2) because no one has, to our knowledge, noted palpable thyroid enlargement as a more or less constant finding among the troops in France; yet McNee and Dunn found the average weight of the thyroid from sixty-five men killed in action 26.7 grams, a figure notably above the normal for civilian males of corresponding age. Again, palpable thyroid enlargement is a doubtful criterion of hypersecretion of the thyroid gland; even in Basedow's disease we have the authority of Murray, that a large percentage of the glands are not noticeably enlarged.

When we leave the debatable ground of thyroid enlargement and approach the symptomatology of the two conditions we see a strong justification for the supporters of the hyperthyroidism theory.

There is a striking similarity in the clinical phenomena of the two conditions, and if we disregard the signs in Basedow's disease known to be due to stimulation of the superior cervical the phenomena are identical. These phenomena are attributable to a hyperirritability of the opposing sets of fibers in the autonomic nervous system, and include the following:

(*a*) Epiphora Loewi 0.5 phenomena; excess or lack of saliva.

(*b*) Asthmatic dyspnea or tachypnea.

(*c*) Tachycardia, pulsus irregularis and respiratorius, vasomotor angina.

Subjective palpitation. Transitory change in blood-pressure.

Vasomotor symptoms, especially transitory erythema and dermatographism.

(*d*) Gastrospasm, pylorospasm, gastric hyperacidity, spastic constipation.

Unmotive watery movements, painless diarrhea, unmotive vomiting.

Pollipiuria, polyuria, oliguria.

Profuse sweating. All domain under autonomic control.

There is a growing opinion among students of Graves's disease that we have too long been concentrating our attention on the cardinal triad and too little considering the other phenomena of the disease, and that we have, in the words of Pottinger, been confusing several different entities in our cases of Graves's disease.

The type of Eppinger and Hess, described as sympatheticotonic and characterized by marked exophthalmos, epinephrin mydriasis, Möbius's sign, dry eyes, no sweating, no diarrhea, is a definite entity. These phenomena are attributable to stimulation of the sympathetic fibers whose motor cells lie in the cervical sympathetic, and there is a striking absence of phenomena which lead to the parasympathetic system. For the firm foundation to the pathogenesis of this type we owe much to the researches of the pathological department of the Mayo school, as the following extract from the reports of Wilson and Durant would attest: "It would appear from our examination by the method detailed that definite histological changes do occur in the cervical sympathetic ganglia in hyperplastic toxic (exophthalmic) goitre, and, further, these histological changes consist of various states of degeneration, viz.: (*a*) hyperchromatization, (*b*) hyperpigmentation, (*c*) chromatolysis and (*d*) atrophy of the nerve cells. All these are but successive steps in degeneration, which, if uninterrupted, proceed to the complete destruction of the ganglion cells affected. Not all of the ganglion cells in any of the ganglia examined were so completely destroyed as to render impossible their return to normal, under favorable conditions. There is some evidence that in ganglia, from cases clinically improved, some of the cells have partially or wholly recovered.

After separating cases of this type from the syndrome of Graves's disease we have left a greater group in which the symptomatology is attributable, in great part, to tissues supplied by the autonomic nervous system. Particularly is this so in cases of hyperthyroidism without frank exophthalmos. In such cases, if we except the thyroid increase, all the phenomena may be attributed to hyperactivity of the greater vagus system. It does not appear possible to us that hypersecretion of the thyroid autocoid can explain these striking differences in clinical pictures.

Let us examine the autonomic nervous system. All tissues in the domain of this system have a double innervation. Normally, there is a stable balance between the innervation of one set and the other set of fibers in this system. In both diseases under discussion there is a hyperactivity of both sets of fibers, and the problem in the study of the pathogenesis is the determination of the mechanism and causation of this hyperirritability. It has long been assumed that the autocoid of the thyroid is responsible for the irritability of this system. It was explained that thyroid sensitized or lowered the threshold of these nerve fibers. Recently, considerable doubt has crept into the literature on the subject, as Pottinger's able analysis of the syndrome will show. The supportive proof of thyroid sensitization of any portion of the autonomic system is bound up in the thyroid adrenal interrelation. This is one of mutual stimulation in which the thyroid secretion sensitizes sympathetically innervated tissues to the action of adrenalin; but it is not clear that this action is more than its effect on the pressor fibers in the presence of adrenin. And, again, in weighing this fact we must keep before us that the balance of proof is against there being adrenin in the blood in other but extreme emergency. A much stronger argument against the sensitization theory of the thyroid autocoid is the failure of Levy to demonstrate any effect on the vagus system.

The other commonly accepted explanation of the signs of hyperirritability was that it was due to an adrenalemia. It was believed that a greater than normal outflow of adrenin increased the irritability of the sympathetic fibers, and that, as a result, in attempting to maintain an equilibrium in the autonomic system, a compensatory hyperirritability of the opposing mechanism resulted. This view we believe untenable in the light of our present knowledge. In addition to a stimulation of the tissue supplied by the sympathetic adrenin renders inactive the opposing mechanism. This is illustrated in the musculature of the gut, the bladder and the blood supply of the kidney. Here in the presence of adrenin essential functions may be carried on, but by the action of the autocoid of the pituitary. This requirement of the organism in the presence of adrenin of other autocoids is well illustrated by the part the thyroid plays. Hoskins and McClure show, by a study of the adrenal effect on the arterioles of the body, that the net effect of pure adrenal activity is not a pressor effect on systemic blood-pressure, and the work of Levy demonstrates that the pressor effect formerly accredited to adrenin is realized by the secretion of the thyroid gland which Cannon and Cattell show is mobilized in the blood in the presence of adrenin. There is little opposition to the consensus of opinion among leading endocrinologists of today that adrenin is present in the blood only in states of emergency, and it is a fair deduction from the foregoing discussion that in the presence of the emergency its action is to supplant rather than to support the involuntary nervous system and in the maintenance of an equilibrium, in the absence of involuntary

nervous activity, it is supplemented by other autocoids. We do, however, believe adrenin may play a part in precipitating the syndrome, and in such a way as will be analyzed later in the paper.

We believe, from the foregoing comment, that we are justified in the assertion that there is a definite need to search further than the autocoids of the thyroid and adrenal for the cause of the disturbance in the autonomic nervous system, and particularly should this scrutiny be directed to factors operating in the causation of the predominant vagal phenomena. Further, it seems reasonable to consider the thyroid secondary, and in some instance compensatory to a derangement which finds origin in the vegetative nervous system.

The theory that inherited constitutional predisposition is a factor in the development of instability of the autonomic nervous system is undoubtedly on a sound basis. The vagotonic and sympathicotonic types of individuals described by Eppinger and Hess are familiar to us all, and it is clear that this predisposition determines the predominance of one of the other set of symptoms in the autonomic system in some cases of Basedow's disease. The part that inherited instability plays in the etiology of neurocirculatory asthenia is probably better illustrated in the studies of the American draft army than in any other group of cases. Both the studies of Robey and Boas and Brooks emphasize this point. Among the draft troops the etiology in the cases was uncomplicated by the many factors of active service known to play a part in the causation of the syndrome. While we agree with Robey and Boas in the conclusion that inherited constitutional tendency is a definite factor in the causation of the syndrome, we cannot agree that all cases are attributable to an inherited constitutional tendency, and that they cannot be cured. This understanding of the causation fails to explain the great number of cases that have developed among men who long flourished in good health on active service in France. Oppenheimer emphasizes this, that 39 per cent. of the group studied at Colchester had absolutely negative histories and had given valuable military service before breaking down. It is safe to say that infection may be the determining etiological factor among the greater number if not all the cases developing among men on active service. This brings before us the question of infection as a cause of autonomic nervous instability. In our work with trench fever, which was by far the most common infection in the troops, we found unmistakable evidence of hyperirritability in this system. The men ill with trench fever uniformly evidenced marked vagal phenomena during the febrile and convalescent stages. Approximately 85 per cent. of cases of trench fever recovered promptly after the febrile illness. The remaining number gradually passed through a subacute on to a chronic state of illness, characterized by irregular low-grade fever, varying degrees of splenic enlarge-

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ment and a group of nervous phenomena characterized by hyperexcitability of the voluntary and involuntary nervous systems, catalogued clinically as neurasthenia and D. A. H. The deduction from a study of these cases is that the infection was responsible, in the first instance, for the vagal phenomena, and with the cure the patient was rid of the organisms. In the second group the deduction was that the persistence of the infection maintained a hyperirritability of the vagus system and that the attempts of compensation in an equilibrium consistent with a lower plane on the individual resulted in the clinical picture of the chronic disease, or what has been called effort syndrome in some instances, neurasthenia in others. That this picture indicates a chronic infection, in which there is a constant outpouring of the toxins, seems established in the experiments detailed in the following cases:

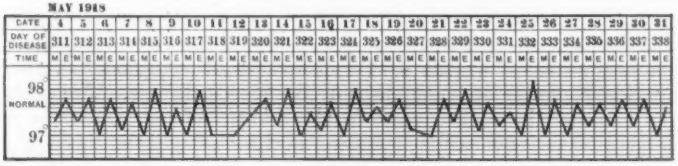

CHART I

CASE 16, aged twenty-eight years, was an A1 man on enlistment, October 12, 1916, and normal during training. To France, April, 1917. On July 5, 1917, he was admitted to hospital with a febrile illness which continued six days and in which he had headache, shin-bone pain and pain in the back. On July 23, 1917, he was invalided to England for pain in the legs, weakness, shortness of breath and giddiness, and during the succeeding months he ran a low grade of fever, with moderate splenic enlargement, chronic muscle and bone pains, especially in the legs, and a progressive nervous instability, with loss of weight and strength. The following is a note of his condition taken from his chart: "Very shaky; sweats freely; flushed face; acute pains in shins; pulse irregular. At night wakes; 'has to fight for breath;' very nervous; sleeps poorly; depressed; frontal headache; breathless on slight exertion; at times dizzy." This is a usual picture of his condition throughout nine months during which he was under observation and in which little result in treatment was realized. In April, a year after his infection, although under hospital care practically the whole time, he presented the picture of a very marked case of neurocirculatory asthenia in which "neurasthenic symptoms predominated."

On the evidence of an eminent authority on neurology this case was transferred to a special hospital under the care of specialists in this branch and returned with a diagnosis of classical neurasthenia.

Clean lice were then fed upon this man throughout the period of the above chart, and following this the excreta from these lice was rubbed into a healthy volunteer who, in the normal incubation period of eight days, developed trench fever. To confirm the experiment further, healthy lice were fed upon the first volunteer who contracted the disease, and by means of their excreta successful transmission to another healthy volunteer was effected.

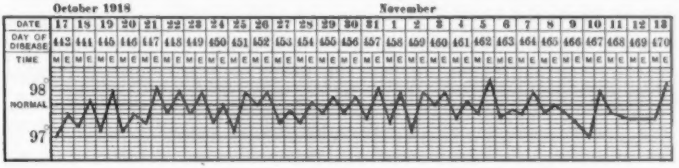

CHART II.

CASE 889, aged twenty-three years, enlisted December 27, 1914; went to France in August, 1915. During training was perfectly fit. Carried on full active duty in France until August, 1917, when he began a febrile illness, with shin-bone pain; pain in back; stiffness of ankles and knees; chills; giddiness. After hospital treatment in France and England he attempted light duty. During the year subsequent he was chronically invalided; in June he was in hospital with a febrile relapse. In September, 1918, he was admitted to the New End Military Hospital with a temperature of 102°; dyspnea; palpitation; giddiness; marked nervousness; frontal headache; shin-bone pain; pain in loins, knees and around ankles; eyes pink; notices he gets worried by trifles; feels depressed without cause; occipital headache constant but of varying severity; heavy over eyes; giddiness.

Jan. 1, 1919. Tâche active red; extrasystoles many, one minute after pulse test; complains of marked depression; lack of interest in life; frontal headache; aching in back of neck; sleeplessness, due to itching of skin; urticarial condition.

Jan. 30, 1919. Breathlessness on exertion since first attack of trench fever; loss of concentration; disinclination to do; effort syndrome poor; marked respiratory rhythym to pulse (sinus irregularity). Extrasystoles after exercise; marked fall in pulse volume in deep breathing.

Lice were fed upon this man during the period of the disease indicated by the above chart and the disease successfully transmitted to a healthy volunteer.

Now let us attempt to find an explanation for the vagotonic phenomena in infectious diseases. Probably the most recent and ingenious theory of disease is founded on Vaughan's experiments. He showed that any kind of fever could be produced and maintained

for weeks by regulating the size and frequency of dosage of protein. The basis of this is anaphylaxis, in which the parenteral reception of foreign proteins so modifies the cells of the body as to develop a special proteolytic capacity for that particular protein, the process of sensitization. This capacity for specific proteolysis is later exercised at a rate and in a degree to produce toxic substances and certain definite clinical phenomena. The exact composition of these toxins is not known. It is believed that histamin is one of them. Their chief influence is exerted in their action on the vagus system or the muscles supplied by it (Schultz). They therefore closely resemble pilocarpin and the other class of vagus irritants. Histamin, pharmacologically, is in the same class as physostigmin, muscarin and cholin and the like, according to Smith. He traces out the action of pilocarpin and the action of anaphylatoxins in two parallel lines, as follows: If pilocarpin is administered to an individual already showing a tendency to vagus excitability a more marked effect is produced than is obtained when the same dose is administered to a normal individual. When we administer antitoxin for diphtheria to the same type of individual, the vagotonic, we may irritate the vagus system to the point of death, whereas a normal individual is only slightly affected, if at all. Not all vagotonics, however, are susceptible to this exaggerated reaction to horse serum. If one vagotonic reacts to horse serum with symptoms of anaphylactic shock while another does not, manifestly the vagotonic does not in itself determine the response, and a constitutional inferiority of the nervous system does not explain the reaction. The classification of this hyperacute form of serum sickness as an anaphylactic manifestation is not questioned any longer, and the individual displaying it is regarded as sensitized to horse serum. When the shock is survived an anti-anaphylactic state has been observed in some instances. The question may therefore well be asked: "Is not vagotonia in these cases itself an expression of an anaphylactic state, which becomes acute under a specific toxic influence, the same sensitization and previous milder intoxications accounting for the hitherto milder expression of vagotonia?" If such be the case then these phenomena bear a close relationship to the experimentally induced protein fever of Vaughan. The chronicity of the period of sensitization which must be assumed in the vagotonic cases is approximately in Vaughan's experiments.

Smith submits some very substantial evidence that vagotonia, seen clinically, is due to a toxin acting like pilocarpin and histamin, which he considers in most cases an anaphylatoxin. The evidence is set down under the three following headings: (*a*) The closeness of the clinical analogy to experimental anaphylaxis; (*b*) the reasonableness of a protein antigen to play the part of sensitizer and intoxicant under anaphylactic conditions; (*c*) the possibility of demon-

strating in the blood antibodies lytic to the suspected protein or in the tissue a specific reactivity.

Certainly, Smith presents a strong array of facts justifying his conclusion of the infectious origin of vagotonia. When we go further and apply this theory to hyperthyroidism and consider that the beginning may be in a parasympathetic hyperirritability, due to a toxin, we find others more or less of the same opinion. As common a disease as tuberculosis is generally recognized to be in large part an anaphylactic disease. Vagotonic phenomena are a prominent feature in the clinical picture. The resemblance of the toxic types of tuberculosis to hyperthyroidism is strongly emphasized by many authorities who note with what great difficulty the differential diagnosis of one from the other may be made. Crile is authority for the statement that, excepting the lesion itself, the postmortem findings in tuberculosis are indistinguishable from those of Graves's disease, and in spite of opinions to the contrary, as preëminent an authority as Pottinger supports the toxemic theory, as the following quotation shows: "I realize that scientific opinion of today is toward the theories that insufficient iodin being obtained by the individual and that of infection being the causative factors in the enlargement of the thyroid gland, but I cannot help but think that a hyperplasia of the gland takes place in the presence of toxemia while no infection of the gland itself occurs." He believes that the hyperirritability in the autonomic system is attributable to thyroid sensitization, the thyroid hypersecretion in turn by increased adrenin in the blood. We believe the evidence is against thyroid sensitization of the vagal fibers in the system and against the adrenal hyperactivity under such conditions.

Clinicians who have followed the work of Lane and his school cannot help but be impressed with the part played in the etiology of hyperthyroidism by material from the large gut. McGarrison's work in this connection is of extraordinary interest. Not uncommonly the teeth, the tonsils and the accessory sinuses have been established as the determining factor, and while admitting the possibility of reflex irritation through the nerve trunks to either the cervical sympathetic or the gland itself, one leans rather to the belief that the chronic infection is the cause. From the foregoing discussion it seems reasonable to conclude that infection, in a great many instances, may be the determining factor in the development of hyperthyroidism, and that many cases of neurocirculatory asthenia have an analogous pathogenesis.

And now let us consider the part the thyroid plays. We know that thyroid secretion follows upon the discharge of adrenin into the blood. This seems firmly established by the work of Cannon. It therefore is active in fright, fear and like sudden emotional states, but that it is transitory and passing with the emergency, when so induced, seems likely, as is the case with adrenin the activator.

Another cause that would seem established is that of primary stimulation in disease of the cervical sympathetic as described by Wilson and Durant. But both causes are operable only in a small group of cases in the syndrome, and we believe there is still a large unexplored field to be worked in establishing the etiology in the disease. Hence, the following facts about a factor we believe of considerable importance.

Barr maintained that the syndrome occurring among the troops in France, which he believed to be hyperthyroidism, was due to a vicious circle in which the deficiency of calcium in the blood was a contributory cause in the production of the hyperthyroidism and the excessive action of the thyroid the cause of a greater calcium metabolism. When we consider that the minimum of calcium per day required for the normal human nutrition is 0.45 gram, and that in the absence of milk from the dietary pounds of meat or common milled cereals would be required to furnish it, the conclusion is justifiable that the fighting units fail to realize their calcium need. Since the time of Besredka it has been known that calcium salts prevent the appearance of anaphylactic phenomena when toxic doses of anaphylatoxin are simultaneously given with the calcium. Burridge has shown that the capacity of tissue activity to compensate inhibition is in direct ratio to its calcium contents. The assumption seems reasonable that deficiencies of calcium in the system require increased thyroid activity in order to liberate calcium from the storehouses. This seems undoubtedly true in view of the established fact that under all contingencies of diet and activity the calcium concentration of the blood is maintained at extraordinarily constant levels and that a greater need for calcium exists in the presence of diseases with which anaphylaxis is a part, this mobilization of calcium compensating inhibitory phenomena in tissue and allowing approximately normal activity.

And now we propose to indicate the relative degree of responsibility of the different factors we believe to be acting in the causation of the syndrome of soldiers' heart.

Two classes of individuals developed the syndrome: (1) the men who, after successfully passing the draft board examination, manifested the syndrome after reaching camp, a result, it would seem, of the nervous and emotional strain of ordinary military service; (2) men exposed to the rigors of active service who manifested the syndrome, and in a great number the onset was fairly sudden, developing in men who had carried on in perfect fettle, in some instances for as long as two or three years before breaking down. Two deductions seem justifiable from these facts that in the individual of potential autonomic instability (neurocirculatory asthenia) the nervous and emotional strain of military service will probably promptly precipitate a syndrome, and that in a normal man factors other than the strain of service are necessary to develop the potentiality.

As an explanation of the manner in which emotional stress and strain act as a cause in the syndrome we have the work of Cannon. He demonstrated in the animal adrenin mobilization in considerable amounts in such states, and it has long been accepted that adrenin acts upon the autonomic nerve structures. We agree that adrenin effect probably explains in part the sensitization of this system in the soldier. But that it is the single factor concerned we somewhat doubt. It would seem probable that profound inhibition in states of fear in the soldier combine with adrenin effect in sensitizing the autonomic system. The training toward and realization of perfect discipline in the soldier is in great part to establish the ascendancy of inhibition from the higher centers over just such primary impulses as those with which adrenin mobilization is concerned.

It would seem probable then that the common state of men in active combatant areas was one of fear, in which the autonomic nervous system was subjected to showers of adrenin and at the same moment profound inhibitory impulses from the brain. An illustration of this may be drawn in that of a spirited horse that at the same moment is locked into inaction by strapping or a tight rein and is cut deeply with a whip.

Another phase in the problem concerned with the understanding of the pathogenesis of functional disease in the soldier, which we believe had been too little considered, is the disturbance of tissue chemistry which we may discuss in terms of calcium metabolism. Gaskell and Elliott, after destruction and degeneration of the nerves of the vegetative system to a part, have demonstrated, after six weeks, full adrenin effect on the part. This would seem to establish adrenin action as directly on the tissue and independent of the vegetative system itself.

Burridge establishes from his experiments that the action of adrenin is to make the tissue independent of its media, particularly the calcium concentration in the prefusing media. Maximum heart work was maintained on a perfusing solution containing one-twelfth the required calcium content when adrenin was added to the solution.

These facts would suggest that individuals living for any time under conditions, such as emotional stress, which tended to a maintenance of relatively high amounts of adrenin in the blood would very soon have an unbalanced tissue chemistry. These facts would explain how the soldier on an abnormally low calcium diet would appear to maintain a calcium equilibrium, and only with the development of sudden call for more calcium, as in acute disease, would we expect manifestations of deficiency.

We believe, therefore, that there is considerable ground for the opinion that some of the phenomena of disease among soldiers, notably the bone pains, tremors thought to be cerebral in origin and

general exaggerated response to normal stimuli are an expression of the disorganization of the inorganic chemistry.

However much there is a disagreement on the mechanism of the forces acting in the production of the syndrome neurocirculatory asthenia in what we may call the potential individual at the present moment, we are more concerned with the factors which result in the potentiality, because in our case of the civilian we must be prepared to recognize in its incipient and mild types what has undoubtedly been a very common condition classified under varieties of neurosis, and we believe infections to be the predominant factor in causation of the potentiality. This is the point we wish particularly to emphasize in this paper and consider the other points of interest here only in so far as they support this belief.

CONCLUSIONS. 1. That some types of hyperthyroidism are analogous to the entity neurocirculatory asthenia and their pathogenesis is probably identical, the phenomena being attributable to a hyperexcitability of the opposing sets of fibers of the autonomic nervous system.

2. That in both conditions the syndrome develops in individuals in whom there is a hyperirritability of one or other sets of fibers in the autonomic system. Hence, constitutional predisposition due to inherited sympathetic or vagotonic instability is a factor in the causation on a sound basis.

3. That nervous and emotional strain is the immediate cause, precipitating the syndrome in susceptible individuals.

4. That in the cause of susceptibility (acquired instability of the autonomic nervous system) infection plays a predominant role and the susceptibility in such cases may be accepted as indicating a chronicity of the infection with constant or frequent outpourings into the blood of the infective agent.

5. That there is a certain rationale for believing that this instability in the autonomic nervous system lies in the element of anaphylaxis in disease in the predilection of anaphylatoxin for the parasympathetic system.

6. That there is some evidence that deficiencies of calcium in the diet may have played a part in the causation of some of the phenomena and that the higher plane of inorganic metabolism in the organism may have shared with adrenin increase the responsibility in causation of the thyroid hyperplasia and hyperthyroidism among the soldiers.

REFERENCES.

Gaskell: The Involuntary Nervous System, 1916, Monographs on Physiology.

McGarrison: The Thyroid Gland, Ballière, Tindall Cox, London, 1917.

Cannon and Cattell: Some Conditions Controlling Thyroid Activity, Med. and Surg. Jour., 1916, clxxiv, 138.

McFarlane: Neurocirculatory Myasthenic, Jour. Am. Med. Assn., 1918, lxxi, 730.

Robey and Boas: Neurocirculatory Asthenia, Jour. Am. Med. Assn., 1918, lxxi, 525.

Oppenheimer: Jour. Am. Med. Assn., 1918, lxxi, 529.
Hoskins and McClure: Endocrinology, No. 4, i, 292.
McNee and Dunn: Report of Medical Research Committee, Special Report Series, No. 8, p. 60.
Levy: Am. Jour. Physiol., July, 1916.
Burridge: Quar. Jour. Med., April, 1917.
Murray: Basedow's Disease, Osler's System.
Pottinger: (1) Endocrinology, March, 1918; (2) Tuberculosis, 1917, vol. ii.
Vaughan: Protein Split Products and Disease, Herter Lectures, 1913.
Wilson and Durante: Reports of Mayo Clinic, 1917.
Eppinger and Hess: Jour. Nerv. and Ment. Dis., 1915.
Brooks: Jour. Am. Med. Assn., 1918, lxx, 28.
Da Costa: Am. Jour. Med. Sc., The Irritable Heart, January, 1870.

THE RELATION OF THE BACILLUS INFLUENZA TO THE RECENT EPIDEMIC.

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As an indication of the comparative suddenness of this epidemic, it may be noted that in the index number of the *Journal of the American Medical Association*, June 29, 1918, which includes the preceding six months, there are but three references to influenza. During the following six months the index number of the same journal shows over 175. Yet in spite of the many articles on the subject, there still remain certain unanswered questions. One of these undetermined points is the source of the epidemic, another refers to the date of its inception, a third as to the etiological factor.

Naturally, no country is particularly anxious to admit that it was the originator of the outbreak, any more than in the past was there any desire to claim paternity for syphilis, which in France was known as the Italian disease, while in Italy it was accredited to France. Although the present infection has been known popularly as the "Spanish Flu," there is really very little incriminating evidence.

It seems that during the early spring, and also in the autumn of 1917, scattered cases of influenza were reported from as widely separated areas as England, France, Vienna and lower Austria. At no time did it reach epidemic proportions, yet the evidence indicates that the potential possibilities were present. During the winter of 1917 and 1918 there does not seem to have been any noticeable increase. In the middle of April, 1918, the reports from the A. E. F. showed, however, that a widespread outbreak had occurred of a disease whose course was characterized by a sudden onset, high fever, headache and backache, lasting three to five days, and leaving in most instances a profound weakness. This epidemic was of unusual mildness and disappeared largely by the end of July.

During the same period a similar outbreak took place in Spain, following the same course in regard to mildness and duration. The Spanish physicians state that the medical profession in Paris had reported cases of influenza there several weeks before it made its appearance in Spain. On turning to reports from Germany it becomes evident that that country was having its own difficulties so far as influenza was concerned, as during the spring of 1918 it was suffering from a widespread infection.

To add to the difficulty of the situation a visitation of influenza made its appearance in Manila, in the Philippine Islands, in June, 1918. Coutant[1] reports that at the same time 30 to 40 cases occurred on a United States transport which left San Francisco shortly before the epidemic appeared in Manila and arrived after the epidemic was over. Reports come also from London that the epidemic there was widespread in June.

From the United States Navy Base Hospital No. 2, in France comes the information that on July 16, 1918, nineteen Hindus, from a single vessel, and who had just become ill with influenza, were admitted to the hospital. There had been a few cases previously at the Base, but beginning with the above a distinct epidemic occurred. The place from which the Hindus came was not stated. About this same time, July 15, 1918, comes the report from Havana that during the preceding months one-fourth of the population was taken ill by an epidemic of a disease similar to the grip. It presented the same symptoms as occurred in the Spanish outbreak, and was thought probably to have been carried to Cuba by Spanish vessels.

Chelsea, Mass., reports that during the two weeks from August 28, 1918, to September 11, 1918, a severe and rapidly spreading epidemic of influenza appeared. This developed within one or two days after the arrival from the receiving ship of the first group of some fifty patients. The disease was carried to Boston probably by patients and by carriers. On September 9, 1918, the disease first appeared at the Great Lakes Receiving Station. From that time on first one city or camp was attacked and then others in rapid succession, until the entire country was overwhelmed.

During these months, reports were coming from all parts of the world to the effect that the epidemic had made its appearance. In August, Peru was being swept by the plague. In October, Mexico City reported the epidemic. The South Sea Islands were attacked, as were parts of Alaska and of Jamaica; no area seemed to be immune. It apparently made no difference whether the countries were hot or cold, wet or dry, high or low, the visitation showed no partiality.

During the spring the disease seemed to be quite mild, lasting but a few days, with slight mortality, and there was but little suggestion of what was to come. But when the recrudescence took place

[1] Jour. Am. Med. Assn., November 9, 1918

there was a sudden and unexpected change. It was no longer a mild and innocuous affair, as at first, but became an appalling scourge. From the latter part of September, for the next two months, practically the entire world was swept by the outburst. Why there should have been such an increase in virulence may possibly be explained on the basis of an increase due to the transmission of the organism from one individual to another until a very high degree of virulence had been acquired. During the summer months, when the community spends a greater part of its time out of doors, the chances of infection are less; during this time, however, scattered cases were constantly occurring. As soon, however, as any crowding took place the contagion spread and the organisms having become more virulent, gave rise to a more serious infection.

The greater part of the evidence would indicate that the influenza epidemic had its origin in Europe, but in just what section it is impossible to state. From there it came to the eastern part of the United States and rapidly extended. There remains one feature that is difficult to explain, how it was that there was an outbreak in Manila, and at the same time a transport arrives from San Francisco with 30 to 40 cases on board. These outbreaks arising somewhat before the disease seems to have gained entrance to the eastern United States. So far as the epidemic in Manila is concerned it might have resulted from an extension of the disease from China. In fact, one of the explanations of the origin of the epidemic in western Europe was that it might have been carried by Chinese coolies who were brought into areas close behind the front.

During the first outbreak it was noticed that the great majority of the patients attacked were in the prime of life, anywhere from twenty-five to thirty-five years of age. The two extremes, childhood and old age, which are usually the ones to suffer when respiratory infections occur, were not at first involved to any extent. It was not until the second wave in this country had made its appearance that the extremes in age were attacked.

Etiology. When the epidemic made its appearance the general opinion held was that influenza had once more occurred as a pandemic—that we were dealing with a clinical condition resulting from infection by the bacillus of Pfeiffer. As reports of bacteriological examinations began to come in the opinion was that the Bacillus influenza was the causative agent. Very soon, however, more and more doubt was entertained as to its importance. The results were most confusing and conflicting.

Krumbhaar[2] reports finding in 75 per cent. of his cases a bacillus identified with that of Pfeiffer. Keegan[3] states that the results of cultures taken directly from the lungs show that the Bacillus

[2] Jour. Am. Med. Assn., November 9, 1918, p. 1573.
[3] Ibid., September 28, 1918.

influenza occurred either in pure or mixed cultures in 82.6 per cent. of the 23 cases studied. M. J. Rosenau[4] obtained it in 83 per cent. of his first 26 autopsies. Tunnicliff[5] isolated it in 58 per cent. of sputum cultures made in the first or second days of the disease. In the report of the influenza epidemic in the British Armies in France[6] it is stated that the Pfeiffer bacillus was recovered in 91 instances from a series of 220 specimens of sputum, 60 times from 164 specimens from the nasopharynx and twice in the blood from 68 cultures. Gotch and Wittingham[7] in 50 cases found the organism in cultures in 8 per cent. and influenza-like bacilli in smears of 62 per cent. of the cases.

Soper[8] states that "The causative agent is generally believed to be the bacillus of Pfeiffer." Hall, Stone and Simpson[9] in the examination of sputum and throat smear found the bacillus 58 times in 79 uncomplicated cases. Park[10] says that "With our present technic we have found Pfeiffer's bacillus in almost every case of clear-cut infectious influenza." Brem, Bolling and Casper,[11] in reporting the epidemic at Camp Fremont, Calif., obtained 25 per cent. positive results in 148 cultures from the nasopharynx in consecutive cases. In 537 selected severe cases it was found in 46 per cent. In Germany[12] Uhlenhuth in a series of 47 cases recovered the influenza bacillus by culture in 46.8 per cent., and Bergman in 75 per cent. of twenty sputums examined. In a communication from Buenos Ayres[13] comes the information that the bacillus was found in 60 per cent. of the sputum of cases, usually the more severe. In fatal cases it was found in 50 per cent.

Spooner, Scott, and Heath[14] report important findings as made at the Base Hospital Laboratory, Camp Devens, Mass. They succeeded in isolating the Bacillus influenza from pneumonia sputum, pleural fluids and the nasopharynx during life, and from the heart's blood, lungs and accessory sinuses postmortem in a high percentage of cases of this disease, very frequently in pure culture. The Bacillus influenza occurred alone or with other organisms in 23, or 62 per cent. of 37 cases at autopsy. It was recovered also from the sputum of 104 cases, usually in connection with some type of the pneumococcus or the streptococcus. Specific agglutinins which produce satisfactory reactions on homogeneous and heterologous cultures were found in the serum of convalescents, especially during the weeks following infection. A high titer serum has been produced in rabbits

[4] Jour. Am. Med. Assn., December 21, 1918.
[5] Ibid., November 23, 1918.
[6] British Med. Jour., No. 18, ii, 205.
[7] Ibid., 1918, ii, 82.
[8] Jour. Am. Med. Assn., December 7, 1918.
[9] Ibid., December 14, 1918.
[10] New York Med. Jour., 1918, cviii, 621.
[11] Jour. Am. Med. Assn., December 28, 1918, p. 2138.
[12] Ibid., November 9, 1918, p. 1573.
[13] Ibid., January 4, 1919. [14] Ibid., January 19, 1919.

by repeated inoculations with living cultures. This serum has showed an increase of potency with the passage of time.

Other investigators, however, were unable to find the organism in such high percentages. Gotschlich[15] obtained it in 12 per cent. of the examinations of 23 sputums, Uhlenhuth made cultural recoveries in but 13 per cent. Blanton and Irons[16] in 366 cases obtained the bacillus in 8 per cent. Cummings,[17] 12.4 per cent. in a series of 100. Nuzum and others[18] in 8.7 per cent. in a total of 2000 cases and Strouse and Bloch[19] 20 times in 273 examinations. In the German reports[20] Lubarsch in 14 cases found it once, Schmorl in 3 out of 50 cases in the bronchial mucus. Hirschbruch once in 15 cases and Gruber and Schadel 14 times in 250 cases.

We find other men who were not as successful as even those just mentioned. Grüber, in Munich, and Friedman, in Berlin, failed to find the influenza bacillus, and Kolle, in Frankfort, was unable to find it in any of the cases which he had thoroughly examined.[21]

In most of these instances the influenza bacillus was not found in pure culture; in the vast majority there have been other organisms in association, usually a pneumococcus or a streptococcus. Hall, Stone and Simpson[22] obtained pneumococci 76 times and hemolytic streptococci 4 times out of 79 cases. Blanton and Irons (*q. v.*) in smears and throat cultures obtained hemolytic streptococci in 33 per cent., and pneumococci in 12 per cent. They also make the interesting report that 357 throat cultures taken before the epidemic began, from apparently healthy men, gave 75 per cent. of hemolytic streptococci and but 1 per cent. influenza bacilli. Strouse and Bloch (*q. v.*), although finding the Bacillus influenza 20 times in 273 examinations, report that streptococci, staphylococci and pneumococci predominated. Brem, Bolling and Casper (*q. v.*), as already stated, found influenza bacilli in 46 per cent. of 537 cases, but usually associated with other organisms. Keegan (*q. v.*), in cultures from more than 100 cases, found that the predominating organism was a Gram-positive diplococcus, forming a considerable green area surrounding the small gray colonies.

In an article on vaccines in influenza[23] the following sentence occurs: "The organisms most frequently associated with Pfeiffer's bacillus, and in their opinion chiefly responsible for the gravity of the secondary pulmonary complications, are pneumococci and streptococci." Tunnicliff (*q. v.*) isolated a green producing streptococcus in 87 per cent. of 110 cases of influenza and pneumonia. According to Hirsch and McKinney[24] the predominating organisms

[15] Jour. Am. Med. Assn., November 9, 1918, p. 1573.
[16] Ibid., December 14, 1918.
[17] Ibid., December 21, 1918.
[18] Ibid., November 9, 1918, p. 1573.
[19] Ibid., November 9, 1918.
[20] Ibid., November 9, 1918, p. 1573.
[21] Ibid., November 19, 1918 (quoted from Nuzum).
[22] Ibid., December 14, 1918.
[23] British Med. Jour., October 26, 1918, p. 470.
[24] Jour. Am. Med. Assn., November 23, 1918.

in the epidemic of bronchopneumonia at Camp Grant were Gram-positive cocci, usually diplococci. In 200 postmortems the cultures showed Gram-positive, lancet-shaped diplococci. In all the throat cultures the occurrence of the influenza bacillus was only occasional and never in pure culture. The *British Medical Journal*, November 16, 1918, states that, "The influenza bacillus, the pneumococcus, and above all in this epidemic the streptococcus, seem to be responsible for most of the fatal complications of influenza." Nuzum and others (*q. v.*), in their 2000 cases found pneumococci to be the predominating organisms in the sputum, in throat cultures and in the lung cultures, both during life and at necropsy. Pneumococci of unusual virulence were the most important early secondary invaders. Glaus and Fritschie[25] in 53 autopsies found the fatal complications of influenza to be due to a mixed infection with pneumococci, streptococci and staphylococci. No influenza bacilli were found.

Various reports from other sources agree with those given above. Bie[26] and others report from Copenhagen that sputum collected from influenza patients immediately on entrance into the hospitals showed invariably numerous pneumococci alone or predominating. Pfeiffer's bacillus was not found. They obtained constantly Gram-positive, lanceolate diplococci, usually encapsulated even when occurring in chains. In 28 instances they were obtained in pure culture from sputum. Blanton and Irons (*q. v.*), made smears and throat cultures in 366 cases and obtained the following results: Hemolytic streptococci, 34 per cent.; non-hemolytic, 33 per cent.; pneumococci, 12 per cent.; influenza bacilli 8 per cent. Cummings[27] in a series of 100 specimens obtained hemolytic streptococci in 27.6 per cent., Group IV pneumococci in 90 per cent., and Micrococcus catarrhalis in 20 per cent.

In addition to the various forms of cocci mentioned above, Ciauri[28] reports the cultivation from the blood and sputum of influenza cases a microörganism that appears in two forms, rods and ovals, but both stain deeply at both poles, the rods being Gram-positive, the ovals Gram-negative, but the two forms were always found in the cultures. This organism was found only in the graver cases, those which seemed to be of a septicemic type. He calls it the "bipolar diplomorphus hemoseptic bacillus." Somewhat similar organisms have been reported elsewhere, but nothing really definite concerning them has been determined.

The more closely the reports are examined the more do the indications point toward the cocci as being the dangerous invaders,

[25] Correspondenzblatt f. schweiz. Aerzte, Basel, September 7, 1918.
[26] Ugesgrift f. Laeger, Copenhagen, Jour. Am. Med. Assn., December 14, 1918.
[27] Ibid., December 21, 1918.
[28] Policlinico, Rome, Jour. Am. Med. Assn., November 16, 1918, p. 1700, and December 28, 1918, p. 2183.

those that are really responsible for the severity of the epidemic. The role played by the influenza bacillus apparently becoming less and less important. In fact, we find many men doubting its importance, Synnott and Clark[29] are by no means certain that the Pfeiffer bacillus is the original infecting agent. Bischer[30] reiterates that his findings in the prevailing epidemic point to invasion by highly virulent streptococci and that there was not the slightest evidence to prove that the influenza bacillus was the cause of the disease. Ely and others[31] state that "Our findings failed to show that it (Bacillus influenza) was in any way connected with the production of the disease." Hirsch and McKinney (*q. v.*) believe that the "Bacillus influenza played no role in the epidemic at Camp Grant." Brem, Bolling and Casper (*q. v.*) hold that "Pfeiffer's bacillus is an incidental or secondary invader."

The question as to what is the cause of the disease remains unanswered. It seems quite evident that the dangers of the disease are due to the secondary invaders and that the relation of the Bacillus influenza is of little importance. As early as October 5, 1918, an editorial in the *Journal of the American Medical Association* remarks that the "Causative agent of epidemic influenza has not been certainly recognized," and that "There is much uncertainty as to its (Bacillus influenza) etiological role." Again, the same journal (October 12, 1918), in another editorial states that "The precise cause of the primary acute respiratory infection is not known—it may be the Bacillus influenza; as yet definite proof is wanting." The British Research Committee[32] quotes from German sources. Obendorfer: "The primary bacteremic condition was not found due to Pfeiffer's bacillus, and thus the invading virus remains undiscovered." Bergman never found the Bacillus Pfeiffer in postmortem material, and states: "The real virus remains to be discovered." In an article on "The Prevention and Treatment of Influenza"[33] the following statement occurs: "Although there can be no question that the virus of influenza is a living organism and capable of transference from man to man, yet the nature of the virus is still uncertain." At the meeting of the American Public Health Association[34] Jordan stated that "We have in cases of pandemic influenza an infection with an unknown or unrecognized virus which increases the susceptibility of the individual." Vaughan: "I should say it (influenza) is a disease of unknown origin." Hektoen: "I think we must be dealing with a disease of unknown etiology." In the same number of the above Journal the following occurs in an editorial: "The discussions relative to the etiology of the present epidemic resolve

[29] Jour. Am. Med. Assn., November 30, 1918, 1816.
[30] Correspondenzblatt f. schweiz. Aerzte, October 5, 1918.
[31] Ibid., January 4, 1919.
[32] Ibid., November 9, 1918, p. 1573.
[33] British Med. Jour., November 16, 1918.
[34] Jour. Am. Med. Assn., December 21, 1918.

themselves into the belief that the influenza bacillus is not the primary etiological factor and that the actual cause is unknown."

Inasmuch as such serious doubts were cast upon Pfeiffer's bacillus, various attempts were made to discover what might be the cause. It was thought by some there might be a filterable virus present, and attempts were made to produce the disease by making use of a filtrate obtained from the sputum in cases of influenza. Probably the first to report such experiments in this country was Keegan (*q. v.*), who worked in conjunction with M. J. Rosenau. Nine volunteers who had not been exposed to the disease were used. The experiment consisted of introducing the filtrate of the washings, from the nose and throat of two cases of influenza, into the anterior nares of the volunteers. The nose and throat of each patient was washed and gargled with 75 c.c. of sterile physiological salt solution. Throat swabs and sputum were added to the separately collected washings. Each was shaken with beads in a sterile bottle and filtered through a Mandler diatomaceous earth filter by means of a water vacuum pump. One filter had a positive pressure of 9 pounds and the other of 12 pounds. Cultures were made from the clear filtrates for control. About 0.5 c.c. of the filtrate was introduced into the anterior nares of each of the volunteers, five receiving the filtrate from one case and four from the other. Three and a half hours elapsed from the time of obtaining the nasal washing until the time of nasal instillation. The control cultures were negative for bacterial growth and none of the nine volunteers have shown symptoms of influenza during ten days of isolation.

In November, 1918, similar experiments were made at the Yale Army Laboratory School, New Haven, Conn., Col. C. F. Craig, M. C. in command, with negative results both as to use of the filtrate and also of the living influenza bacilli. The report of these experiments has not as yet been published.

Nicolle and Le Bailly[35] report several experiments on men and monkeys, in which filtered bronchial secretions of patients in the early stages of typical influenza were used. This material was injected subcutaneously and intravenously with apparently some positive results. On careful reading of the original articles it becomes evident that too much reliance should not be placed upon the results, as the experiments were few in number; they were done during the height of the epidemic upon persons who in all probability had been exposed. Also, the volunteers had not been isolated for several days before the inoculations were made. The evidence is far from conclusive.

In addition to the bacteriological findings there is still further evidence against the Bacillus influenza being the important causative agent. A study of the reports dealing with the clinical course of

[35] Compt. rend. Acad. de sc., 1918, clxvii, 607.

these causes shows that the usual blood picture is that of a leukopenia. Practically all observers agreed that such was the condition found that a leukocytosis indicated a complication, usually of pneumonia. In other words the infecting agent, whatever it might be, interfered in some manner with the formation of white cells, with a consequent leukopenia. At the Yale Army Laboratory School blood examinations were made of about 150 men who had been inoculated with influenza vaccine. These counts were made at varying periods after the inoculation. The results showed that there were no evident alterations in the blood picture. There was neither an increase nor a decrease in the number of white cells nor was there any alteration in the normal percentages of the different varieties of leukocytes. One might consider this fair evidence against the importance of the influenza bacillus as the cause of the epidemic.

Almost as soon as the cases made their appearance, treatment by means of so-called vaccines was instituted, in spite of the fact that such a method is not applicable to acute general infections. On account of the rapidity of the invasion it was necessary to make use of stock instead of autogenous vaccines. As is usually the case a number of men were quite enthusiastic, but more careful investigation indicated that it was not effective. A committee, consisting of Rosenau, Gay and McCoy was appointed in Massachusetts to consider the evidence available on the prophylactic and therapeutic use of vaccines against influenza. They presented the following conclusions:[36]

"1. The evidence at hand affords no trustworthy basis for regarding prophylactic vaccination against influenza as of value in preventing the spread of the disease or of reducing its severity. The evidence from the present epidemic, though meager, suggests that the incidence of the disease among the vaccinated is smaller than among the non-vaccinated. The board, therefore, concludes that further experimental evidence should be collected.

"2. The evidence at hand convinces the board that the vaccines we have considered have no specific value in the treatment of influenza.

"3. There is evidence that no unfavorable results have followed the use of the vaccines."

A second committee appointed in Massachusetts and reporting at the same time, consisted of Whipple, Davis and Crum. Their report follows:

"1. The weight of such statistical evidence as we have been able to accumulate indicates that the use of the influenza vaccine which we have investigated is without therapeutic benefit.

"2. The statistical evidence, as far as it goes, indicates a probability that the use of this influenza vaccine has some prophylactic value.

[36] Jour. Am. Med. Assn., October 19, 1918.

The committee also reported that "the use of such a vaccine is to be regarded as experimental."

In October and November, 1918, quite a large number of officers and enlisted men at New Haven, Conn., were given repeated injections (three) of an influenza vaccine in the hope that it might prove to be of some value as a prophylactic. The results were such that the general opinion was that the vaccine had little value if any. There were numerous instances in which those who had been injected acquired the disease within a comparatively short time. Barnes[37] compares the results in two series of cases in one institution, one series of 152 unvaccinated persons, the other of 113 vaccinated. He found that the morbidity was only slightly lower among the vaccinated and the mortality among those who developed influenza was practically the same, whether vaccinated or unvaccinated.

The article of Spooner and others (*q. v.*), up to the time of publishing, is the most weighty bit of evidence in favor of the Bacillus influenza being the cause of the epidemic. The fact that they obtained well-marked agglutination in high dilution with the serum of convalescent patients is of distinct importance, as was the production of a high titer serum in rabbits inoculated with living cultures. More work along these lines would be of great value.

Conclusions. To recapitulate, it is first shown that although many observers found the Bacillus influenza in cultures in quite a high percentage of cases examined, there were just as many equally skilful men who found the organism in a very small number of the cases cultured or did not find it at all.

It is evident, and recognized by all, that the serious symptoms were not due to the presence of the Bacillus influenza, but were the result of invasion by secondary organisms, these being mainly pneumococci and streptococci.

Accompanying the disease was commonly a well-marked leukopenia, which, however, did not occur when killed cultures of influenza bacilli were injected. In a series of about 158 individuals examined after such inoculations, there was in fact no alteration from the normal blood picture. The injection of these cultures did not appear either to prevent the disease nor to ameliorate the condition after injection had occurred.

The inoculation by filtrates of sputum and bronchial secretions cannot be said to have caused the disease, nor has the infecting of the nasopharyngeal mucous membranes with recently isolated pure cultures of living influenza bacilli given rise to symptoms.

In view of the above findings it would seem that the evidence is not in favor of the Bacillus influenza being considered the etiological factor in the recent epidemic.

[37] Jour. Am. Med. Assn., December 7, 1918.

BACILLUS BOTULINUS POISONING: WITH A REPORT OF SEVEN CASES, FOUR OF WHICH PROVED FATAL.

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For many years occasional outbreaks of food poisoning of a more or less serious character have been reported from time to time. These were mostly under the title of botulism or allantiasis, the exact nature of which was entirely unknown, until Van Ermengem, in 1895, identified and isolated the Bacillus botulinus. This organism apparently bears a specific relationship to the disease, although it is contended by some observers that at least some of the cases are due to other sorts of infection. It would be an exception to the general laws of epidemiology if mixed infections did not occasionally play a confusing role. I believe, however, that it may be confidently assumed that in all the cases presenting the very characteristic and typical syndrome this organism plays the principal part, and in fact causes the main symptoms by the specific action of an exogenous toxin or toxins, produced for the most part and perhaps altogether under saprophytic conditions.

Because of its direct bearing upon the clinical study of these cases the cultural and other characteristics of the organism become of first importance. It is strictly anaërobic, so that a piece of ham or vegetable, for example, just below the surface of a fluid in which it is partially immersed might be intensely toxic while the supernatant portions would be entirely innocuous. This very probably offers an explanation of many seeming paradoxes, when, for instance, of several persons partaking of the same food some are affected and others not. The original conception of the disease as the result of meal poisoning is incomplete. The designation "sausage poisoning" (botulus), by which it was often known, is, of course, more so. As a matter of fact the organism is found much more frequently in vegetable than in animal food, and in the outbreak about to be described was found only in canned vegetable foods, although the meat which formed a part of the meal had disappeared and could not be examined. In this connection some facts of comparative pathology must receive our attention.

In several parts of this country, at different times, outbreaks of disease among horses and cattle have occurred, known variously as forage poisoning, cerebrospinal meningitis, cerebritis, staggers, blind staggers, cornstalk disease, etc. The records immediately available especially include Kentucky, Illinois and Iowa, and very heavy losses have occurred from this disease. Prof. Robert Graham, of the Department of Animal Pathology in the University of Illinois,

has made very extensive investigations and has isolated an organism corresponding very completely with the Bacillus botulinus. It is morphologically and culturally identical, responds to the same agglutination tests, produces the same characteristic and fatal syndrome in animals, which can be immunized against it by the Bacillus botulinus antitoxin. To this may be added the fact that the pathological findings in animals killed by this organism are identical with those found in animals killed by known Bacillus botulinus intoxication. There would seem to be no reasonable doubt that the two organisms are identical and that this pathogenic saprophyte is very widely distributed throughout the country, producing extensive losses among domestic animals and ready at any time to produce a fatal outbreak in human subjects under favorable conditions. It is indeed quite probable that there are other causes of food poisoning even of an infectious nature, but in all cases in which the very characteristic clinical picture to be later described is found the Bacillus botulinus may be confidently assumed as the infecting agent. Furthermore, there are probably milder and somewhat atypical outbreaks occurring in individuals or groups less characteristic, but still due to this same organism. It is altogether likely that a very small proportion of the outbreaks of botulism have ever been recognized or recorded in this country. A very significant circumstance is found in the literature in different countries. It first attracted attention in Germany, and in the literature of continental Europe up to this time we find no less than 132 communications on the subject. Great Britain has contributed a small number and our country but little more. If the subject receives the attention that it should have, and the cases are recognized, the number of reports in this country will undoubtedly rapidly increase.

I will here introduce the clinical records of the seven cases which form the basis of this paper before discussing the general symptomatology, pathology and treatment. The clinical observations made on these cases were very incomplete, owing to the circumstances under which they were seen. The investigations were hurriedly made in an adjoining town without the assistance of a laboratory technician or clinical assistant on the spot, and hence were not as full as they otherwise would have been.

On Friday noon February 22, 1918, all of the patients, with at least three or four others who entirely escaped, partook of a meal consisting of beef and several vegetables, among which were especially remembered mangoes and canned beans.

As will be seen in the following brief outline of these cases the symptoms developed with varying rapidity on that and the following days.

Case I was seen in consultation with Drs. Boyers and Coverdale and the other patients later under the care of Drs. Smith, D. D. Clark and Miller. I am deeply indebted to these gentlemen, and in

fact the entire medical profession of Decatur, for their cordial coöperation in the observation and study of these cases.

CASE I.—Robert K., Decatur, Ind., aged thirteen years, white. Was seen February 26, 1918, died February 28, 1918. Was taken ill February 23, the day following ingestion of the meal, with headache and vertigo. The following morning, on arising he still complained of vertigo and vomited. Vomiting repeated three or four times during the day. It is not thought that he had any fever on February 24; in fact, vomiting and vertigo were the only symptoms on that day. Dr. Coverdale was called on the evening of February 25 and found a temperature of 99.5°.

On this day, February 25, there were no symptoms except dysphonia and dysphagia.

February 26. Temperature, 99.5°. Is unable to swallow fluids this afternoon; they are not regurgitated through the nose, but simply are retained in the mouth and rejected. Voice has a nasal twang and throat appears obstructed. Has some stomach pain. Pulse, 120. White blood cells, 7800; polynuclears, 78 per cent.; small lymphocytes, 13; large lymphocytes, 9.

Throat smear shows a few large epithelial cells, some streptococci and occasional other non-specific organisms. Cultures yielded streptococci and staphylococci.

Not autopsied.

CASE II.—Mrs. R., Decatur, Ind., aged thirty-seven years, white. Seen February 27, 1918. White blood corpuscles, 13,000; polynuclears, 80 per cent.

Taken ill on Saturday with vomiting. Dysphagia on Sunday. Ate roast beef, other things unknown. About six hours after the noon meal she began to feel nauseated. Friday night she had vomiting and abdominal cramps; the next morning she continued vomiting, which was more severe, and her tongue became stiff. The following day she had ptosis of the eyelids; aphonia and aphagia not marked; slightly drowsy; pain in head; back of eyes "head full." Aphagia complete by Monday evening. Aphonia complete by Wednesday night. Bowels constipated. Temperature always normal or subnormal. Pulse normal until Thursday A.M.; 116 to 120 since. Gets "sinking spells;" is pale; pulse "disappears." Diplopia early and transient. Ophthalmoscopic examination entirely negative. Pupillary reflexes abolished; mydriasis. Medication: cathartics and strychnin merely incidental. Botulinus antitoxin, 5 c.c., subpectorally on March 2, 1918, 8.30 P.M. Patient died a few hours later.

CASE III.—Mr. P., aged forty-one years. February 22, 1918, died February 26. Meal eaten Friday noon, February 22. Late Friday evening was taken sick with epigastric pain, vomiting and diarrhea. Seen by Dr. Clark on Saturday at 3 P.M.

Sunday was stuporous.

Monday morning paralysis of palate and faucial pillars, with slight ptosis of eyelids, slight mydriasis, aphagia, aphonia, and had had no bowel movement since Friday evening.

Tuesday morning, slightly icteric conjunctivæ; complete mydriasis; pulse, 120, sleepy; no pain or distress. Ophthalmoscopic examination negative; mentally clear; pulse rapid and weak. No rise in temperature at any time. Pallor throughout illness. Salivary secretions not marked. Respiratory embarrassment all day. At 6 P.M. he died suddenly. It is not known absolutely whether or not he ate of the meat.

CASE IV.—Miss B., Decatur, Ind., waitress, aged nineteen years. Ate beef heart and vegetables. Saturday vomited once or twice; bowels constipated; later had difficulty in swallowing; dysphagia; tightness in throat. Could protrude tongue half-way on Monday, but not at all on Tuesday. Ptosis complete; could not see without raising lids with fingers. Was able to wait on table Sunday evening.

First seen by Dr. Smith on Monday; ptosis of left eyelid and slight ptosis of right; slight mydriasis; aphonia; aphagia; diplopia; pulse, 78; temperature normal or slightly subnormal; drowsy; vertigo. Wednesday, swallowing improved.

Thursday, generally worse, also respiratory embarrassment; precordial pain; pulse, 130; respiration, 32.

Wednesday and Thursday, extreme and complete mydriasis. Mentality clear at all times. Died 9.30 P.M. on Thursday. Not autopsied.

CASE V.—Mrs. R., Decatur, Ind. Ate beef and vegetables on Friday. Within twenty-four hours the usual syndrome of vomiting, dysphagia, dysphonia, mydriasis and diplopia developed. The symptoms grew progressively worse, with extreme prostration. I saw her on March 3: throat was paralyzed; could only swallow with difficulty and had fetid breath. Deglutition had become gradually worse; that morning was able to take a half-ounce of tea, but nothing else. Dysphonia. Had a great deal of mucus in the throat, but was so "awfully weak" that she could not spit it up. Ptosis of left eyelid.

A few days later her physician reported that the patient was improving. Ptosis had disappeared and she was able to swallow liquids to some extent. Temperature and pulse normal. Had been taking 1 c.c. of serum every three hours. The larger doses seemed to disagree.

March 26, 1918, her physician reported patient practically recovered; ptosis, dysphagia and dysphonia entirely gone and general strength very good.

Blood findings: March 4: White blood cells, 14,000; polynuclears, 76 per cent.; small lymphocytes, 14; large lymphocytes, 4; transitionals, 4; basophiles, 2.

CASE VI.—Mrs. P., aged forty-three years. February 27, 1918. Ate beef and vegetables for dinner and eggs for supper; vomited after supper. Vomited Saturday, the following day; noticed numbness and could swallow liquids only; this increased until Monday, when she could not swallow at all. Slight ptosis and slight mydriasis Monday. As the result of catharsis, she passed some stool each day. Had vertigo at first. Later diplopic. Able to swallow liquids the ensuing Friday and Saturday.

The following report was received from her physician, March 7, 1918:

"Beginning with the following morning at 9.30, this patient was given 2 minims of the serum; there being no reaction she was given 5 c.c. in thirty minutes more; 5 to 10 c.c. doses of the serum were repeated at eight- to ten-hour intervals; 3 ounce doses of olive oil were given and serum continued in 10 c.c. doses daily for five days, during which time the patient gradually improved generally. Condition of bowels resumed normal or nearly normal functions, and by the end of the fifth day the most important symptoms had disappeared and the patient was decidedly better."

CASE VII.—Mr. L. Ate beef heart only. Bowels not constipated; left vocal cord paralyzed. Later came to hospital. Two days after meal he began to have regurgitation of fluids through the nose as the very first symptom. Four days after the meal he said his eyelids were heavy, not closed, but definite diplopia. Could not expectorate. Saw him at hospital two or three times. While at hospital he slowly improved. Had slight dysphagia and diplopia, which gradually disappeared. No serum administered.

PATHOLOGY. The pathology of botulinus intoxication presents some very striking and altogether characteristic features. Thanks to the labors of Van Ermengem, Gaffky, and more recently Prof. Graham, the main facts have been completely elucidated and a clear picture of the pathology can now be formulated. The organism itself is a spore-forming, non-motile, anaërobic bacillus, 5 to 9 μ long.

It grows best in the presence of glucose and requires a medium that is either neutral or slightly alkaline. An excess of salt and light is unfavorable for its growth.

The photomicrograph (Fig. 1) which illustrates its morphology was made by Prof. Graham from cultures of the organism obtained from ensilage. The biological characteristics of the organism have a very important bearing on its pathogenesis and the prophylaxis of botulism.

The optimum temperature for its growth is 25° to 35° C. It apparently will grow at body temperature, but becomes very much attentuated, with consequent loss of virulence, and spore formation disappears. It is killed at 85° C. for fifteen minutes.

In this connection it should be mentioned that the toxins of this organism, which are exogenous in character, as well as the bacteria

itself, are destroyed by boiling, a fact which has an obvious bearing upon the prophylaxis of botulism.

The resistance of the organism under favoring conditions is shown by the fact that the spores are viable after being kept one year in hermetically sealed tubes protected from light. Toxins obtained from the filtrates made from the cultures of this organism freed from the bacilli by passing through a Berkefeld or other similar filter have been carefully studied by Prof. Graham and others.

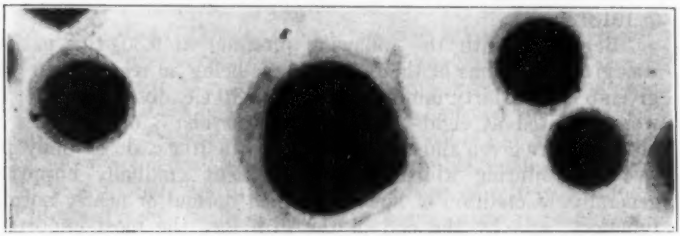

FIG. 1.—The colonies on glucose agar showing areas of liquefaction surrounding each colony.

The most important symptoms experimentally and clinically are of a neuroparalytic character.

In small quadrupeds—such as mice, guinea-pigs, etc.—paralysis of the hind legs is an early manifestation.

FIG. 2.—Prophylactic value of botulinus antitoxin. Six pigs in the rear, after being given lethal doses of toxin by mouth, received varying doses of antitoxic sera. The two controls in the foreground received a similar amount of toxin orally without antitoxin. Photograph thirty hours following the administration of toxin.

There is a striking difference in the susceptibility of different animals to the toxin. Cats, for instance, can eat large quantities of the culture without serious symptoms, while mice and guinea-pigs if given a piece of bread with one or two drops of the culture are paralyzed and die in twenty-four to thirty-six hours. The

question as to whether the principal effect is exerted upon the central or peripheral nerve elements appears to be yet undecided.

As above stated the clinical picture appears to me to be that of peripheral paralysis, but, on the other hand, there have been found definite histological changes in the central nerve elements consisting of disappearance of the chromatophile granules and formation of vacuoles, with ultimate disintegration of the nerve cells.

These changes have been especially found in the region of the third and fourth ventricles, which possibly accounts for the involvement of the vagus, hypoglossus and glossopharyngeal nerves. Even if death follows quickly there is found, in addition to the neuropathic changes blood extravasations and alterations in liver, spleen and kidneys.

If death is delayed, hyperemia, necrosis or advanced fatty degeneration may be found.

In poison by mouth severe gastro-intestinal lesions are found showing softening of intestinal coats, with hemorrhagic areas and severe alterations in some other organs.

It is interesting to note that subdural inoculation of the toxin does not produce more rapid results than when taken by mouth. This is in contradistinction to the effect of tetanus toxin.

The mydriasis which is so characteristic a feature of the clinical picture is not increased by the instillation of the toxin directly into the eye.

Symptomatology. The clinical picture as elucidated by careful study of my cases, and this corresponds very closely with the symptoms reported by others, is as follows:

In 6 out of 7 cases the first symptoms were nausea and vomiting, with marked general prostration. These symptoms occurred in from six to thirty-six hours, and may be regarded as an expression of the initial constitutional effect of the toxins upon circulation, the nervous system, glandular organs, etc. The time incidence of these symptoms is generally earlier the more intense the intoxication. This was true in all with the exception of one fatal case, in which these symptoms did not appear until after a lapse of thirty-six hours. In one mild case they did not occur at all. The next group of symptoms consisted of disturbances of deglutition and phonation occurring usually in this order or simultaneously. They are due, of course, to the selective action of the toxin upon either the nerve fibers concerned in these functions or the centers from which they arise. They certainly bear a close resemblance to diphtheritic paralyses, which are known to be a result of the fixation of the diphtheritic toxin in the peripheral nerves. Pathological studies in fatal botulinus poisoning seem to have demonstrated changes in the ganglionic cells of the central nervous system, but the clinical picture is certainly that of a peripheral lesion.

The disturbances of deglutition varied from mild dysphagia to

aphagia. In some cases there was simply an inability of the patient to swallow the food, while in others fluids were regurgitated through the nose. In one case, the mildest of the group, the very first symptom which attracted the attention of the patient was regurgitation of the fluid through the nose on attempted deglutition, and this did not occur until fifty-four hours after the ingestion of the poisoned food. In this case the constitutional symptoms were apparently so slight as to escape the attention of the patient, local paralysis being the very first thing to appear. The patient apparently felt perfectly well and sat down to the evening meal, taking a drink of fluid which escaped through his nose on to the table.

Next in order come the disturbances of the ocular apparatus, both intrinsic and extrinsic. Diplopia, amblyopia, ptosis and mydriasis were practically constant in all the cases. The amblyopia in some of the cases progressed to nearly complete blindness, the pathological groundwork of which was not revealed by the ophthalmoscopic picture, this being normal in every case which was examined by myself and an oculist, Dr. Miller, of Decatur. The mydriasis was extreme and was probably a quite early manifestation. The diplopia was very constant in some of the milder cases, and persisted for a long time. The ptosis was one of the most conspicuous symptoms. It was very complete in most of the cases, it being necessary to either mechanically elevate the lids or tilt the head far back in order that the patient could look directly forward. The ptosis was undoubtedly associated with a certain degree of motor weakness of the seventh nerve, causing a very marked immobilization of all the facial muscles and giving to the patient a very striking mask-like expression.

In some of the fatal cases occurring quite late there were severe attacks of transient weakness, probably syncopal in character, which indicate an involvement of the cardiac nerve similar to that occurring in the nerve of deglutition, etc. This is rendered plausible by the fact that there was not a corresponding debility of the general muscular apparatus, some of the patients being able to sit up almost up to the time of death.

Another very striking symptom which has been dwelt on by other writers was the paralysis, more or less complete, of the intestinal musculature. The constipation was severe and there was notable absence of any indication of active peristalsis. In one of the cases closely observed by Dr. Smith, of Decatur, active borborygmus appeared as one of the first signs of improvement following the administration of the serum.

TREATMENT. As in most infectious diseases the treatment must be either general or specific in character. In regard to the former, perhaps the only thing needing special emphasis is the importance of active catharsis. It should be a general rule in all suspicious cases of food poisoning to clear out the intestinal tract as quickly and as

thoroughly as possible. This would be a safe if not an imperative rule in any form of food poisoning. This probably would be a rather easy matter if cathartics were early and vigorously administered before intestinal paralysis supervened. It would seem quite probable that some fatal cases might thus be converted into very mild ones. Both the bacteria and the toxins usually linger long, and in largest quantities if not throughout the progress of the case in the intestinal tract, the contents of which should be swept out as early and completely as possible. There is one fact developed in the experimental work, of the utmost importance in these cases, which is that fatty substances apparently combine with the toxin, markedly attenuating if not destroying its virulence. A cathartic oil is therefore the logical remedy, and full doses of castor oil or something of a similar character should be given early and repeatedly.

In regard to the specific treatment the evidence appears somewhat conflicting up to this time. When I saw the first case and recognized its character after the loss of twenty-four hours of time I found myself without any accessible information on this question. By dint of vigorous telegraphing, and finally through the medium of the Bureau of Animal Industry in Washington, I was referred to the University of Illinois, where experimental work had been done in the production of an antitoxin, which happened at that time to be ready for a clinical test, but such a test had not as yet been made. Prof. Robert Graham immediately started for Fort Wayne, Indiana, with an ample supply of antitoxin, which was finally available after about two or three days of waiting. Three of the patients were dead when we reached Decatur with the serum and the fourth died a few hours later. This last patient was given 5 c.c. after making the anaphylactic test, which was repeated a few hours later. It was obviously useless, but the patient had been anxiously waiting for it, and we felt that we could do no less than give it.

Out of the remaining three cases one (Case VII) was extremely mild and was strongly prejudiced against the use of a serum. I told him that I thought he would recover without it but that the experimental ground for its use seemed to me perfectly valid. He declined the serum and made a slow recovery.

Two of the three patients who finally recovered were treated by the antitoxin. One of these was under the care of Dr. Smith, of Decatur. On the morning of March 2 (details given above in Case VI), after the anaphylactic test, with 2 minims, this patient was given 5 c.c. of the antitoxin and at intervals of several hours during the same day two additional doses of 5 c.c. and one of 8.5 c.c. On March 3 she received two doses of 10 c.c. each, the same on March 4, three doses on March 5 and one dose on March 6, when the antitoxin was stopped. I did not see this patient after the antitoxin treatment was begun, but there seems to be no doubt that her

condition, which had been about stationary for several days, began to improve after forty-eight hours of treatment. The ptosis and mydriasis disappeared, deglutition became normal, intestinal peristalsis was restored, with free action of the bowels and expulsion of large quantities of flatus. The general condition of the patient rapidly improved and convalescence was uneventful.

Case V was again seen by me on March 3 in consultation with her attending physician, nine days after the ingestion of the poisoned food. Her condition at that time was apparently desperate, and it seemed to me that she would certainly die. There was complete ptosis and extreme mydriasis and diplopia. There was no light reaction of the pupils. There was practically complete aphagia. The patient was lying at the edge of the bed to allow the oral secretions to run from her mouth. She could not swallow them and they had to be occasionally removed from the throat by a swab. The pulse was frequent, about 115; there was complete obstipation; the patient could scarcely talk at all, the voice having the characteristic intonation of diphtheritic faucial paralysis. The prostration was extreme; a more pitiable clinical picture and one withal more apparently desperate it has rarely been my fortune to see. As above stated, I made the anaphylactic test with 2 minims of the antitoxin, and a half-hour later gave her 5 c.c. of the antitoxin intravenously, which was to be repeated every three or four hours. After giving two or three doses her physician became alarmed because of the reaction, which consisted mainly of increased pulse frequency and general prostration, and reduced the dose to 1 c.c. every three hours, which was kept up night and day for several days.

Three days after beginning the antitoxin treatment her physician telephoned me that the improvement had been very marked. The ptosis had disappeared and the patient could swallow liquids to some extent. From this time on improvement was continuous, and on March 26 she was reported to be practically well. She visited my office a month later, apparently in perfect health.

It was very unfortunate that the antitoxin treatment could not have been instituted very early, as this is, of course, the only logical time to prevent the serious paralyses which result from the specific action of the toxin, which the antitoxin has been shown experimentally to be capable of neutralizing. The only thing that could be expected of antitoxin given at so late a time would be to render innocuous the toxins circulating in the blood at that time as well as any additional toxins which might be poured into the blood from any existing reservoir or foci. Such a reservoir, I think, undoubtedly is found in the contents of the large intestine, where the bacilli have been repeatedly demonstrated. They are growing there under saprophytic conditions and very probably continually producing toxins which may be absorbed into the circulation. In fact, these

toxins have been experimentally demonstrated in the large bowel by animal inoculation of filtrates of intestinal contents. Such benefit as was derived from the antitoxin in Cases V and VI was undoubtedly due to the fixation of toxin derived from this source, and especially in Case VI, it certainly looks as though the scale were turned in the patient's favor by neutralization of the toxins, which in all probability were being constantly absorbed from the intestinal tract. Up to the time of commencing the antitoxin treatment this patient was growing worse, and the clinical evidence is very strong that the improvement which promptly followed was the direct result of the treatment.

A review of all the facts concerning botulinus poisoning seems to support the conclusion that the organism is of very widespread distribution and that any community may at any time have such a visitation as that recorded in this paper. These outbreaks are undoubtedly quite rare, but are probably much more frequent than has been supposed. Furthermore, the experimental and clinical evidence as to the efficacy of the antitoxin in destroying the toxin is sufficiently strong to warrant its use, especially in view of the fact that there is no other treatment worth while. There are two obstacles in the way of prompt treatment at the time when it can do the most good. One of these is the difficulty of early recognition and the other having the antitoxin accessible for use without much delay.

It seems to me that the only practical method of having this antitoxin available would be through coöperation in some way with the Bureau of Animal Industry or some other department of the United States Government.

These outbreaks are so few in number and so far removed from each other that it is very doubtful if antitoxin can ever be furnished commercially.

If a constant supply of this serum could be kept at suitable stations in different parts of the country and used early in cases of suspicious food poisoning, without waiting for confirmation of the diagnosis by animal experimentation or identification of the bacillus, it should be entirely possible to prevent such tragedies as the one here recorded.

I am indebted to Dr. M. F. Porter, Jr., and Dr. B. M. Edlavitch for their assistance in this work.

A REVIEW OF THE EPIDEMIC OF INFLUENZA AT THE BASE HOSPITAL, CAMP BEAUREGARD, LA., WITH SPECIAL REFERENCE TO SYMPTOMS AND SEQUELÆ.

By Donald J. Frick, M.D., Major, M.C., U.S.A.,
Los Angeles, California.

The epidemic began September 21. Cases began to be sent in to the hospital on September 24.

TABLE I.

	Numbers.	Cases of influenza.	Died.
Troops stationed here	15,000	7500	427
Personnel of Base Hospital	610	327	4
Nurses in hospital	300	152	2
Soldiers in 5th Infantry	3,200	2600	125

This table gives some idea of the way the Camp, as a whole, and different organizations were affected. The Fifth Infantry was more severely attacked as the epidemic first appeared there, and the disease was most virulent in the beginning. Of the command approximately 50 per cent. had the disease. Of the 7500 cases of influenza, 1474 developed pneumonia, or 19.6 per cent. Of these 1474 cases of pneumonia, 427 died, a mortality of 29 per cent.

We have placed the period of the epidemic from September 24 to October 18, 1918, as since the latter date admissions have been normal. A good many of the complications and sequelæ here recited have stretched over a longer period.

Charts I and II give salient features of the epidemic. Chart I shows the patients in hospital day by day and Chart II the daily admissions, including pneumonias in hospital as reported (not as they appeared) and deaths day by day.

The Disease. A special report is made in the paper by Capt. McClelland on the bacteriology of the cases of influenza and the pneumonia cases following the influenza. On the day that the first case appeared in the hospital we realized the enormous amount of work that would be thrown on the laboratory staff by such an epidemic, so the commanding officer asked the laboratory men of the different organizations mobilizing here to come into the laboratory and immediately take up the task with Capt. Henderson, of working out the etiological factor of the epidemic. Their work has been of wonderful value and satisfaction to us all.

As is shown in their report the etiological factor was the influenza bacillus and the disease a true influenza.

The symptoms were of exceeding variety as to severity and kind. Most of the cases had severe backache, headache, a racking cough, flushed face, injected eyes, and, as a rule, a pulse between 80 and 100, with a temperature from 101° to 104°. Most all of them were dull and apathetic, went to sleep in the ambulance, slept on the litter while they were being carried into the hospital and had to be

aroused to answer questions. They only roused up to cough, take medicine or nourishment. They all looked prostrated and sick. All slept twelve hours, some sixteen to twenty-four hours. The fever and prostration in the mild cases lasted forty-eight hours, the

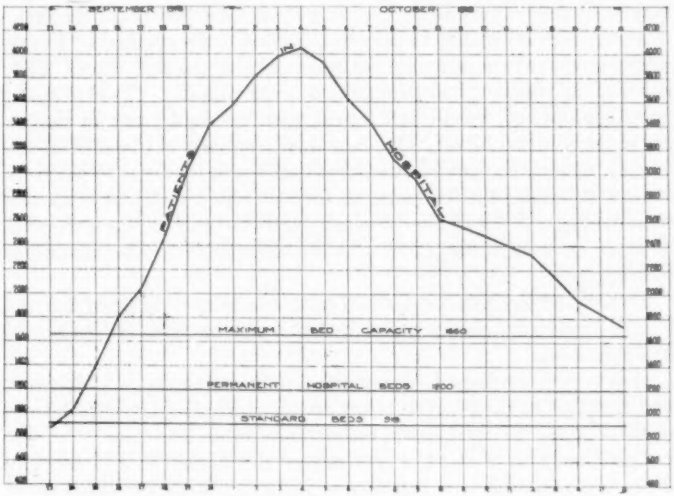

CHART I.—Patients in hospital day by day.

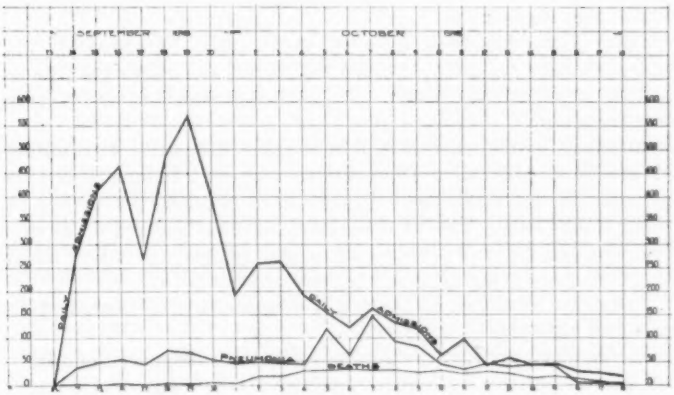

CHART II.—Daily admission, showing pneumonias in hospital as reported and deaths day by day.

patients then began to get up and sit on the edge of the beds. They were all weak and some fainted in trying to get out of bed. The more severe cases had fever for three or four days. Practically all cases that had fever longer than this proved to have broncho-pneumonia. Many had vomiting; some became tender over the

abdomen, imitating an intra-abdominal condition. (See Appendix I for a typical case, Chart 3.)

There was a leukopenia in practically all cases and no rise of leukocytes with the advent of pneumonia.

Besides the ordinary symptoms, a striking feature in the early stages of these cases was the bleeding from some portion of the body. Our statistics show that 15 per cent. suffered from epistaxis. Everywhere one went he saw men with bleeding or packed noses. Fifty cases of subconjunctival hemorrhage were counted. Twelve had a true hemoptysis, bright red blood with no admixture of mucus. Six cases vomited blood. One case died from loss of blood from this cause. Among the nurses, menstruation began in about 80 per cent. two or three days after going to bed. Three cases had intestinal hemorrhage. Most of the bleeding came early, with the exception of three cases of hemoptysis, which came after bronchopneumonia had begun.

Twelve to fifteen per cent. of all cases had herpes either of the lips, tongue, nose or mouth, the eruption being exceedingly extensive in some cases.

Pneumonia developed secondarily to the influenza in 1342 cases, and the complications given below must be regarded as complications of this disease, in most cases, rather than influenza.

Jaundice of a mild or severe degree developed in 112 cases of bronchopneumonia. In those recovering the jaundice disappeared very rapidly, in some cases clearing up entirely in seven or eight days. The liver in all cases seen was enlarged, so we believe it was a true cholangitis.

Otitis media has been reported in 41 cases. Fortunately the otologists were on duty day and night and did immediate paracentesis on all bulging drums. No mastoid operations so far have been necessary.

Infectious psychoses were seen in 18 cases, the patients exhibiting all grades of aberration from simple transient hallucinations to maniacal frenzy which needed mechanical restraint for twelve to twenty-four hours. Two of these cases have not cleared up at this date, one being free of all other signs and symptoms for four days; the other still having signs of his bronchopneumonia.

Two cases developed an hysterical aphonia (which cleared up in three and eight days respectively).

Five cases of pneumococcus meningitis were diagnosed clinically and proved positive by lumbar puncture; 6 to 8 cases were punctured that had some signs of meningitis; these all showed a clear fluid under pressure, no increase in cells and no bacteria.

Eleven cases of epidemic cerebrospinal meningitis were diagnosed and isolated during the epidemic; 3 cases developed after the patients were convalescing from pneumonia and had been in the hospital from three to four weeks. Report of this will be made later.

Cases with a friction rub were of such common occurrence that

we have not been able to give any reliable statistics as to numbers on them.

Empyema cases have appeared at the end of the epidemic. Twenty-nine have been reported so far, 3 cases showed hemolytic streptococcus, 20 cases pneumococci, 7 cases no organism found.

The most interesting complication on account of its usual rarity has been interstitial emphysema, of which we have had 10 cases. Histories of the first case, with picture by Capt. A. L. Levin, and one of the two cases that have lived are hereby appended. (See Appendix I.) Also an autopsy report by Capt. Schultz on one of the cases. (See Appendix II.) The only reason that can be given for the great number of these cases is the violence of the cough and the degenerative changes brought about in the disease. All of these cases had influenza, followed by bronchopneumonia, the subcutaneous emphysema coming from six to ten days after the beginning of the disease. The air was first felt in all cases in a collar about the neck and then gradually spread over the back, chest and arms to the hands as far as the knuckles and down the thighs to the middle. A rupture of the bronchus at the root of the lung seems to us the only explanation.

Two cases after violent coughing developed a pneumothorax, the heart being pushed to the right as far as the midline on that side. (For autopsy on one case see Appendix II.) One case has proved to be a pyopneumothorax.

Capt. Levin presents a brief history and autopsy findings in one of the most remarkable cases of the epidemic, gangrene of the colon with rupture. (Appendix I.)

Briefly, in this paper, we have given the unusual complications in this epidemic. Unfortunately, we did not have the time or the facilities for doing some of the work that should have been done.

We can give no reason for the frequency of hemorrhages, but cannot help feeling that there must have been some definite change in the constituents of the blood, although we made no estimation of the coagulation and bleeding time nor counted platelets.

The effect of the influenza bacillus must be to prepare a fertile field for the pneumococcus, as we have never seen such virulent pneumonias either primary or secondary to measles. Death came rapidly and could be prognosticated practically from the moment the man entered the hospital. The object of this paper and appendices is to put on record for further use the disease as we have seen it. This should be worth while.

APPENDIX I.

Case I.—Case of influenza; no complications.

Reg. No. 23,718. M. J., Pvt., Co. C, Dev. Bn. Admitted October 23, 1918. *Family History* and *past history* not important. *Present Illness.* Onset sudden, with aching over the whole body and pains in the head and cough.

Examination. Signs of a bronchitis. Sputum shows Bacillus influenza and Type IV pneumococcus.

Blood Count. Whites, 5000; polymorphonuclears, 48 per cent.

Urine. Negative. (Chart III.)

CASE II.—Case of interstitial emphysema bilateral (died).

Reg. No. 19343. C. J. R., white, aged twenty-three years. Native of Louisiana, carpenter, robust physique. Four months in service. Onset of influenza September 23, 1918. Admitted September 24, 1918. Symptoms of influenza. Diagnosed: Bronchopneumonia at base of right lung on September 30, 1918. Coughed

FIG. 1 (Case II).—Showing bilateral interstitial empyemas.

violently when temperature lowered; cautioned about it. Began to improve when subcutaneous emphysema developed at 3 P.M. on October 6, 1918. Died at 10 A.M., October 8, 1918.

Past History. Malaria, treated at Base Hospital.

Diagnosis. Interstitial emphysema bilateral.

Result. Death. (Fig. 1, Chart IV.)

CASE III.—Case of interstitial emphysema (with recovery).

Reg. No. 22920. H. N., Pvt., Co. K, 5th Infantry. Admitted to hospital October 5, 1918. Diagnosed: Bronchopneumonia October 8, 1918.

October 12. Became delirious and unmanageable.

October 13. Subcutaneous emphysema developed over the left

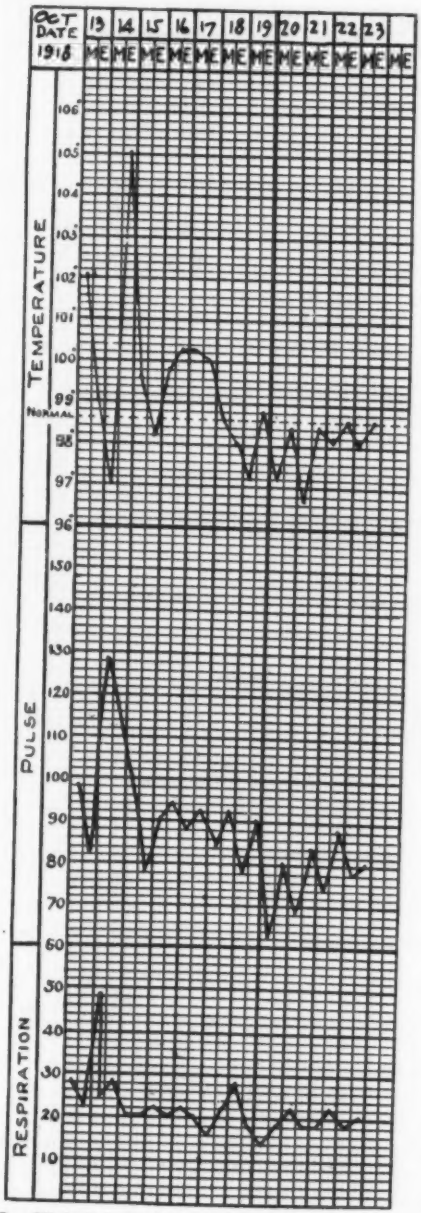

CHART III.—Clinical chart of Case I, uncomplicated case of influenza.

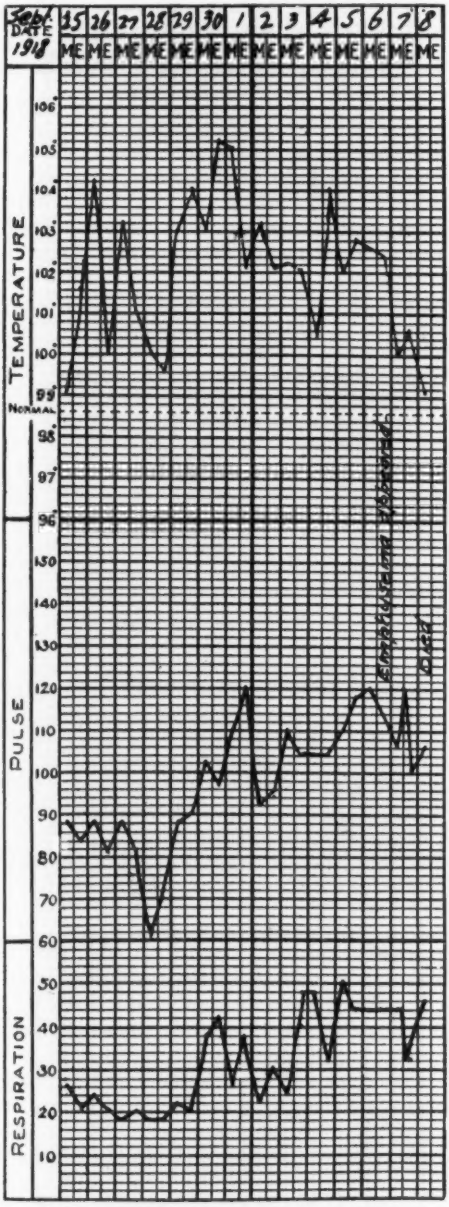

CHART IV.—Clinical chart of Case II. Fatal bilateral interstitial emphysema.

chest, left arm and hand. Same day developed a tremor over the whole body; eyes wild and staring; talks incessantly.

October 16. Patient wants food; lungs better.

October 20. Emphysema practically disappeared except under left clavicle.

October 28. Practically well; chest clear; emphysema gone. (Chart V.)

CASE IV.—An unusual complication of bronchopneumonia, Type III.

Reg. No. 23476. C. C., Pvt., Co. G, 29th Infantry. Miner by occupation. Three and a half years in service. Admitted October 9, 1918, with influenza. Bronchopneumonia detected on October 11, 1918, left lung, Type III sputum and blood culture.

October 18. Marked abdominal distention noticed (upper abdomen).

October 10. Purulent pleural fluid obtained; culture: pneumococcus, Type III. Plastic pneumococcus peritonitis suspected on October 20.

October 23. Distention relieved.

October 25. Pus obtained from left chest. Operated on the same evening, 9.30 P.M. Dyspnea, cyanosis, collapse. Died 11.50 P.M.

October 26. Autopsy: Plastic pneumococcus peritonitis, rupture of transverse colon the entire length; gangrenous, fecal matter freely in pocket. Transverse colon eight inches in diameter; small and large intestines agglutinated.

APPENDIX II.

Autopsy Protocol, No. 1.

Name: E. V. Autopsy No. 6.

Rank: Sergeant, Co. E, 5th Infantry.

Time of death: 2 A.M., September 28, 1918.

Time of autopsy: 9 A.M., September 28, 1918.

Admitted: September 26, 1918.

Clinical Diagnosis. Lobar pneumonia, right lower.

Anatomical Diagnosis. (1) Acute catarrhal bronchitis; (2) diffuse bronchopneumonia of both lower lobes; (3) acute hemorrhagic pleuritis of right lung; (4) acute splenic tumor; (5) cloudy swelling of liver, kidneys and myocardium.

External Examination. The body is that of a well-developed, white male, about seventy-one inches long, weighing about 185 pounds. Strong rigor is present, and there is marked lividity of the posterior surface of the body and of the left side of the face. There are no external marks of injury or of identification.

Internal Examination. A thin layer of subcutaneous fat is present. The peritoneal cavity is free of adhesions and of fluid. The pericardial cavity contains a slight excess of fluid which is partly clotted. The left pleural cavity is normal. The right contains a slight excess of fluid, which is faintly clouded and slightly blood-tinged.

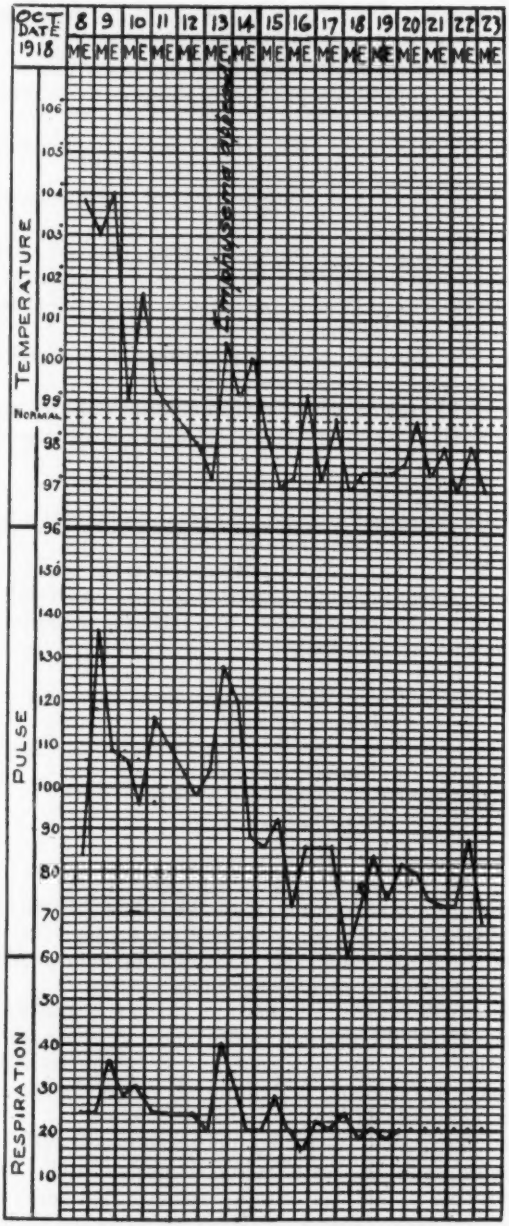

CHART V.—Clinical chart of Case III. Interstitial emphysema, with recovery.

Lungs. The pleural surface of the left is smooth and glistening. The lower lobe, although it contains air, feels heavier and less crepitant than normal. On section the lower lobe is congested, and the cut surface, from which frothy fluid escapes, is very finely granular, the appearance suggesting the consolidation of innumerable groups of small numbers of alveoli, these being separated by small groups of air-containing alveoli. The upper left lobe is crepitant and pale pink in color. The pleura of the lateral surface of the right lung is finely granular and hemorrhagic, but its surface contains the fibrin. The lower lobe is congested, and like the lower left lobe is heavier and less crepitant than normal. On section it is somewhat more deeply congested than the lower left lobe, but has the same very finely granular appearance. The upper and middle left lobes appear normal. The bronchi of both lungs are deeply congested, but contain no exudate.

Heart. The right side is distended with blood. All the valves and the root of the aorta are normal. The heart muscle is pale and cloudy.

Spleen. The spleen is enlarged to about three times the normal and feels rather soft. The outer surface is smooth and is dark bluish red in color. On section the tissue is dark red and much blood escapes from the surface.

Liver. Normal externally. On section the tissue is cloudy. Gall-bladder and ducts are normal.

Kidneys. Each is slightly increased in size. On section the cortex is swollen and cloudy and the glomeruli stand out as minute, slightly congested points.

Adrenals, pancreas, gastro-intestinal tract, bladder and prostate. Negative.

Bacteriology. Cultures from the heart's blood and from the fluid of the right pleura show no growth. Smears from the lower lobes of the lungs show Gram-negative small bacilli and Gram-positive diplococci. Cultures from the lung yield B. influenzæ and a Gram-positive, bile insoluble, non-hemolytic streptococcus.

Autopsy Protocol, No. 2.

Name: F. W. T.
Rank: Pvt., Co. E, Dev. Bn.
Admitted: September 29, 1918.
Died: 9 A.M., October 4, 1918.
Autopsy: 10 A.M., October 4, 1918.

Clinical Diagnosis. Lobar pneumonia.

Anatomical Diagnosis. (1) Lobar pneumonia of the right lower lobe (red hepatization); (2) pseudolobar pneumonia of the left lower lobe; (3) bronchopneumonia of both upper lobes and of the right middle lobe; (4) acute catarrhal bronchitis of both lungs; (5) acute fibriopurulent pleuritis of right lung; (6) acute splenic tumor; (7) cloudy swelling of liver, myocardium and kidneys.

External Examination. The body is that of a slenderly built

white male, about seventy inches tall, weighing about 146 pounds. The body is still warm and rigor is absent. The neck and face are cyanotic. On the inner surface of the left knee is a large old scar of a burn.

Internal Examination. Peritoneal, pericardial and left pleural cavity are normal. A thin layer of yellow exudate is present over the lower outer half of the right upper lobe and between the lobes.

Lungs. The lower lobe of the left lung is occupied by irregularly shaped confluent patches of dark red, airless tissue, which is congested and granular on section. A smaller wedge-shaped area is present at the lower border of the right upper lobe. The right lower lobe is completely consolidated and on section the tissue is dark red and granular and contains much blood. A few small patches of consolidation are present in the right upper and middle lobes. The bronchi of both lungs are congested and contain no exudate.

Heart. Negative except for cloudy swelling of the muscles.

Spleen. The spleen is increased to twice the normal size. On section the tissue is dark red and soft.

Liver. Cloudy.

Kidneys. The cortex is swollen and cloudy.

Adrenals, pancreas, gastro-intestinal tract, bladder and prostate. Negative.

Bacteriology. Smears from the right upper and lower lobes and from the pleural exudate contain many Gram-positive diplococci. Cultures from these situations contain pneumococci. Culture from the spleen is negative. The heart's blood culture is contaminated by a large Gram-negative bacillus, but contains Gram-positive diplococci, which prove to be Type IV pneumococci in the peritoneal exudate of a mouse injected with the culture.

Autopsy Protocol, No. 3.

Name: R. F.

Rank: Pvt., Co. H., 5th Infantry.

Admitted: September 26, 1918.

Died: 12.50 P.M., October 10, 1918.

Autopsy: 3.30 P.M., October 10, 1918.

Clinical Diagnosis. Influenza. Bronchopneumonia of the left lower lobe. Interstitial emphysema bilateral.

Anatomical Diagnosis. Interstitial emphysema bilateral. (1) Pseudolobar pneumonia of both lower lobes; (2) bronchopneumonia of both upper lobes and of the right middle lobe; (3) interstitial emphysema of the mediastinum and of the subcutaneous tissue of the face, neck, thorax and arms.

External Examination. The body is that of a sparely built white male about sixty-six inches tall, weighing about 130 pounds. Rigor and lividity are not present. The skin of the right side of the face and of the entire neck appears swollen, and on pressure it has a crepitant crackling feel. The same crepitant sensation is elicited upon pres-

sure of the skin of the chest anteriorly as far down as the nipple line, laterally on both sides of the chest to a slightly lower level and about half-way down on both arms. The skin of the crepitant regions is not discolored.

Internal Examination. The peritoneal cavity is normal. When the sternum is removed the tissues of the mediastinum are found filled with air, which occurs in the form of bubbles of varying size held in the loose tissues. The loose tissues of the root of the neck show a similar condition. The pericardial cavity is normal. Both pleural cavities are free of fluid and of adhesions. The lungs are not collapsed and no air is present in the pleural cavities.

Lungs. The two lungs are removed *in toto*, together with the trachea. Bubbles of air are present beneath the pleura of the left lung; these bubbles follow the lines of the interlobular septa. The pleura of each lower lobe posteriorly and laterally is granular and cloudy, but no macroscopic fibrin is present. All the loose tissue about the roots of the lungs contain bubbles of air. The lungs feel heavy, the lower lobes being enlarged and dark red in color. Areas of consolidation are present in both upper lobes, and about half of the right middle lobe is solid. Although the lower lobes are almost completely consolidated, small areas of air-containing tissues are present at the margins and in several places beneath the pleura. When the lungs are immersed in water and inflated by a tube placed in the trachea a steady stream of air bubbles escape from the tissue at the bifurcation of the trachea, the air apparently coming from the left bronchus anteriorly at the level of the bifurcation. On opening the trachea a small tear is found in the mucosa of the anterior wall of the left bronchus in the region from which the air was seen to escape. On section of the lungs both lower lobes are dark red and granular. Scattered about in the dark red tissue are numerous more opaque gray areas two or three lobules in size; these areas appear to have a peribronchial distribution. The right middle and both upper lobes contain areas of consolidation, of varying size, which are grayish red in color and rather soft and friable. The bronchi contain no exudate and their mucosa is not reddened.

Spleen. The spleen is moderately enlarged, firm and dark red. The remaining organs were not examined further.

Bacteriology. Smears and cultures from the right lower lobe show nothing. Cultures from the spleen and heart's blood remain sterile. Smears from the left lower lobe show a few Gram-positive diplococci; the cultures show numerous Gram-negative small bacilli and Gram-positive cocci in pairs and chains. The latter type are Type III pneumococcus.

Autopsy Protocol No. 4.

Name: W. McC.
Rank: Pvt., Co. A, M. P.
Died: 5.15 A.M., October 20, 1918.

Autopsy. 11.00 A.M., October 20, 1918.

Clinical Diagnosis. Pneumothorax.

Anatomical Diagnosis. Pneumothorax (left); suppurative pneumonia of the left lung; bronchopneumonia in the right.

Histological section of the tissue of the right lung, left lung and spleen.

External Examination. The body is that of a well-developed male, weight about 165 pounds, six feet in height. Rigor mortis is present. The skin is clear and there are no deformities or marks; the appearance of his face indicates some emaciation.

Internal Examination. An incision is made from the suprasternal notch to the pubes. The subcutaneous tissue is in good shape.

Lungs. The left lung has completely collapsed. It is nodular, grayish in color which is due to a fibrinous exudate, but there are no adhesions and a little fluid containing pus in the pleural cavity. On section pus flows freely from every nodule. The lung is full of abscesses ranging from the size of a hen's egg to minute abscesses. The bronchi are filled with pus. The right lung has a consolidation in the lower posterior portion of the upper lobe involving the upper posterior third of the lower lobe. The rest of the lung feels as though it is in fairly good shape with plenty of air in it. On section there is pus in the consolidated portions and also, some little pus in the bronchi. The air cells in the seemingly good portions of the lung contain in various areas a little frothy fluid but there are no evidences of inflammation. There are no adhesions except the adjacent consolidated portion. There is little fluid in the right pleural cavity.

Heart. The heart is negative.

The *liver, pancreas, intestines* and *peritoneum* are all negative.

Spleen. The spleen has an infarct about the size of a fifty-cent piece on the upper anterior third. On section it seems inflamed and is somewhat enlarged.

Kidney. The right kidney is large, red and seems swollen, and the capsule peels off easily, but on section it is negative. The left kidney seems identical with the right. The appendix is negative.

BACTERIOLOGICAL OBSERVATIONS ON THE EPIDEMIC OF INFLUENZA AT CAMP BEAUREGARD, LA.

By J. E. McClelland, M.D., Captain, M.C., U.S.A.,
CLEVELAND, OHIO.

There has been so much discussion and uncertainty, so much curiosity and inquiry regarding the etiological factors in the prevailing epidemic of so-called Spanish influenza, that it is deemed appropriate to report the results of our work at this Base Hospital.

The epidemic began here on or about September 24, 1918, and lasted approximately three weeks, the apex of the epidemic being reached about the end of the first week. This report is based on the observations made between September 24 and October 20. During this period there were admitted to the Base Hospital 4980 cases diagnosed clinically as influenza, and of these 1322 developed pneumonia. There were 416 deaths. The entire number of the troops in the division here is approximately 13,000. In addition to the cases admitted to the Base Hospital there were many of those less severely sick who were treated in the regimental infirmaries and quite a considerable number who never went on sick report at all. Several of the enlisted men in the laboratory belong in this last category. It would seem a conservative estimate to say that at least 50 per cent. of the command acquired the infection. Of 300 nurses, 149 were taken sick, and of 610 men in the Base Hospital Detachment 327 went on sick report. These figures are enumerated merely to convey some idea of the magnitude of the epidemic.

On the first day of the epidemic it was decided to select two widely separated wards and make nose and throat cultures on every patient. Half of the cultures were taken on whole blood-agar plates and half on laked blood-agar plates. One plate was used to a patient, the nasal swab being smeared over one-half and the throat swab over the other half. On the same day specimens of sputum from patients with productive coughs were examined microscopically and washed portions injected intraperitoneally into mice. Next, six of those patients that had the highest temperatures were selected as subjects for blood cultures, 10 c.c. of blood being inoculated into 150 c.c. of plain meat-infusion broth.

The examination of the nose and throat cultures the following day showed that the vast majority of the plates contained countless numbers of small colonies transparent to transmitted light, and of such minute size that often the aid of a hand lens was required for identification. Smears from these colonies showed large numbers of small Gram-negative bacilli having in general the morphology and staining characteristics of the B. influenzæ, but showing considerable pleomorphism. Colonies were fished and subcultures made and the same organism obtained in pure culture. The organism proved to be a very delicate one, and even when subcultured daily on blood medium soon died out. It was observed that while large numbers of colonies were obtained from both nose and throat the greater numbers were found in the throat cultures. In one ward 35 patients were cultured and everyone showed positive cultures as described above. Three of the plates also showed hemolytic streptococcus colonies. Unfortunately we cannot report exactly on the cultures from the other ward, as part of this record was lost. However the findings were practically identical. As described by others it was our experience that the influenza colonies

grew to much larger size when in the vicinity of staphylococcus colonies. In the second ward there were found five hemolytic streptococcus carriers.

The direct microscopic examination of the specimens of sputum showed both small Gram-negative bacilli and Gram-positive diplococci, the latter predominating. From the peritoneal exudate and the heart's blood of the inoculated mice both B. influenzæ and Type IV pneumococci were obtained.

All the six blood cultures taken on the first day of the epidemic remained sterile, nor were we able subsequently to identify B. influenzæ in any of our blood cultures.

It was then decided to make throat cultures of the entire hospital, as far as practicable, with the idea of determining how many patients would show typical influenza colonies, and also in order to locate the hemolytic streptococcus carriers, that they might be isolated from the other patients. From September 25 to October 3, throat cultures were made on 1919 patients. Of these 1749, or 91.1 per cent., were positive for influenza, 80 were positive for hemolytic streptococcus, 39 showed both influenza and hemolytic streptococcus and 90 were negative. The total number of hemolytic streptococcus carriers then was 109, or 5.7 per cent. of the entire number cultured.

Lieut. Fitchet performed an interesting experiment. Holding open plates two or three feet in front of patients, he had them cough in the direction of the plates. After incubation all these plates showed many influenza colonies, thus demonstrating the ease of the transmissibility of the infection through unguarded coughing.

As soon as the cases of pneumonia developed the attempt was made to make microscopic and bacteriological examinations on as many of the sputa as possible. While many of the direct smears showed numerous Gram-negative bacilli, the predominating organisms were Gram-positive diplococci having the morphology of pneumococci. Type determinations for pneumococci were made on 723 cases, using the Avery method. The results of this investigation are shown in Table I. The outstanding features of this table are

TABLE I.—TYPE DETERMINATIONS FOR PNEUMOCOCCUS ON THE SPUTUMS OF 723 CASES OF POST-INFLUENZA PNEUMONIA. (AVERY METHOD).

	Cases.	Per cent.
Type I	8	1.1
Type II	61	8.4
Type III	84	11.6
Type IV	570	78.9
	723	100.0

the high percentage of Type IV pneumococcus and the relatively large number of Type III and the small number of Type I. However, from a consideration of the relative incidence of the various types

in normal carriers it would seem reasonable to suppose that many of the patients developed a pneumonia that was really an auto-infection from the organisms already present in their own upper air passages. Undoubtedly the added influenza infection played a very important role either in reducing the patients' general or local resistance to secondary infection, or in some way enhancing the invasiveness of those organisms which were shown to be the most important etiological factors in the complicating pneumonias. At any rate the combined infection was much more virulent and fatal than a pure infection would have been. Moreover, the character of the pneumonia, as given below in the summary of the autopsies, was quite different anatomically, and much more extensive in its distribution than the typical lobar type we are accustomed to associate with pneumococcus pneumonitis.

Blood Cultures. It was thought important to make blood cultures on as many of the sick pneumonias as time and equipment would permit, in order to check up on the sputum examinations and to determine accurately the true etiology of the pneumonias. The technic was simply to inoculate 10 to 15 c.c. of blood into 100 to 150 c.c. of plain meat infusion broth. Plates were not made routinely but only in specially selected cases. In all 129 blood cultures were made on 111 different patients, 54 of these patients, or 48.7 per cent., had one or more positive cultures, while 57, or 51.3 per cent., had negative cultures. In other words, practically one-half of the patients had a septicemia associated with their pneumonia. The bacteriology of the blood cultures is given in Table II. The high

TABLE II.—TYPE OF ORGANISM FOUND IN THE POSITIVE BLOOD CULTURES SHOWING THE HIGH MORTALITY.

	No. of cases.	Per cent.	Mortality.	Per cent.
Type I	5[1]	9.3	2	40.0
Type II	7	13.0	7	100.0
Type IIA	7	13.0	6	85.7
Type III	12	22.2	12	100.0
Type IV	19	35.2	17	89.5
Hemolytic streptococcus	3	5.5	3	100.0
Non-hemolytic streptococcus	1	1.8	1	100.0
Total	54	100.0	48	88.8

percentage of positives obtained contrasts very strikingly with my former experiences in ordinary lobar pneumonia in soldiers as recently reported.[2] Here, again, the high percentage of Type III infections stands out conspicuously. All of the pneumonias accompanied with a Type III septicemia died. The very high mortality in all those cases with a septicemia shows the important part that invasion of the blood stream plays in bringing about a fatal termina-

[1] Two of Type I cases with septicemia received Type I serum and recovered.
[2] Jour. Am. Med. Assn., 1918, lxxi, 1299.

tion. Two of the Type I cases with septicemia received large doses of specific serum, and both recovered.

Serum Treatment in Type I Cases. Four of the Type I cases were treated with serum and all recovered. Two of these cases were extremely sick when the administration of the serum was started. One (E. L.) had a very extensive process involving the entire left lung and the lower lobe of the right lung, a positive blood culture showing three colonies per cubic centimeter; he developed a double otitis media requiring paracentesis, and an empyema appeared on the left side while the pneumonia was still active. He received 1200 c.c. of Type I serum. The empyema was drained and now the patient is convalescing satisfactorily. The other very sick Type I case had a severe septicemia, the blood cultures showing 41 colonies per cubic centimeter. The serum treatment was given intensively every eight hours for ten doses, the patient receiving 1000 c.c. A second blood culture taken two days after the first was negative. The other two cases were moderately sick and both recovered promptly. In this small series of Type I cases the serum treatment was satisfactory.

Hemolytic Streptococcus Cases. Three patients showed hemolytic streptococci in the blood cultures and all died, which coincides with my former experience that practically all cases of hemolytic streptococcus septicemia terminate fatally. In three other cases hemolytic streptococci have been recovered from the empyema fluids. Two of these cases have been operated on and the third has been treated by simple aspiration. All are still in the hospital, and it is still too early to predict the ultimate outcome.

Pneumococcus Meningitis. Only two of the pneumonias developed meningitis as a complication. Both cases showed a Type IV pneumococcus in the spinal fluids and in the blood cultures. One of these patients had such a severe septicemia that it was impossible even to approximate the number of colonies in the plates. Probably in both cases the meningitis was of hematogenous origin. Both patients died soon after the appearance of the meningitis. We have not encountered any cases of influenzal meningitis.

Empyema. To date (October 27) there have been 29 cases in which thoracenteses have revealed the presence of fluid in the pleural cavity. The bacteriology of these fluids is given in Table III. Again, the high percentage of Type III pneumococcus infections is remarkable. The number of sterile effusions (seven) seems rather large, but corresponds with my previous experience that the elaboration of a sterile pleural effusion is not uncommon following pneumonia. This type of cases gets along very well with simple aspiration and practically never require more radical surgical interference. The large number of empyema cases that showed pneumococci in the smears and cultures again indicates that organism as the true etiological factor in the majority of the post-influenzal pneumonias.

The influenza bacillus was not found in any of the cultures made from the pleural fluids.

TABLE III.—TYPE OF ORGANISM FOUND IN 29 CASES OF EMPYEMA FOLLOWING INFLUENZA AND PNEUMONIA.

	No. of cases.	Per cent.
Type I	4	13.8
Type II	0	0.0
Type III	6	20.8
Type IV	7	24.1
Undetermined	2	6.9
Hemolytic streptococcus	3	10.3
Non-hemolytic streptococcus	0	0.0
Sterile effusions	7	24.1
	29	100.0

Autopsies. During the early part of the epidemic twelve autopsies were performed. These were all done by Captain O. T. Schultz, and it is from his reports that the following notes are made.

In eight of the cases (protocols 8, 9, 10, 11, 12, 13, 14, 17) there was found a very extensive bronchopneumonia, most marked in the lower lobes, but, as a rule, involving portions of all five lobes. The process was usually so extensive in the lower lobes that Captain Schultz describes the pathology as pseudolobar pneumonia. In seven of these eight cases both B. influenzæ and pneumococci were demonstrated in smears or cultures from the lung tissue, showing that these patients were suffering from a double infection. Seven of the eight cultures from the heart's blood were positive. Two yielded a Type II pneumococcus, two a Type III pneumococcus, and three a Type IV pneumococcus, and in one of the Type IV cases a pure culture of pneumococcus was also obtained from the spleen. Once more we call attention to the important role of the pneumococcus in bringing about the fatal termination. In none of these eight cases was there any pericarditis, endocarditis or peritonitis. The amount of pleuritis was small considering the extensiveness of the pneumonias, and none had any collection of fluid in either pleural cavity.

The remaining four autopsies (protocols 6, 7, 15, 16) differed essentially from the foregoing and merit separate descriptions. One case (protocol 15) showed bronchopneumonia of the left upper lobe, atelectasis of the right lung with a fibrinopurulent pleuritis with effusion (1000 c.c.) and fibrinopurulent pericarditis with effusion (250 c.c.). Cultures from the affected portions of lung, from the empyema fluid, from the pericardial fluid and from the heart's blood all yielded pure cultures of hemolytic streptococcus. This was evidently identical with the hemolytic streptococcus pneumonias which were so prevalent in some of the camps last winter, especially following measles.

Another case (protocol 16) proved to be a typical lobar pneumonia involving the right upper and lower lobes with a marked fibrinopurulent pleuritis. Smears and cultures from the affected lung showed many pneumococci but no B. influenzæ. The spleen culture yielded pneumococci in pure culture and a Type IIA pneumococcus was obtained from the heart's blood. This case was evidently a straight uncomplicated lobar pneumonia.

The third case (protocol 7) was also a typical lobar pneumonia involving the right upper and middle lobes, with a marked fibrinopurulent pleuritis. In addition, however, there was an acute purulent bronchitis of both lungs. Smears from the right lung showed many Gram-positive diplococci, but the smears from the bronchial exudate of the left lung showed also many Gram-negative bacilli. Cultures from the heart's blood gave a pure culture of Type I pneumococcus. This patient had then both a pneumococcus pneumonia and an influenzal bronchitis.

The fourth case (protocol 6) showed a diffuse bronchopneumonia of both lower lobes, an acute hemorrhagic pleuritis of the right lung, with a slight amount of cloudy, blood-tinged fluid in the right pleural cavity. Cultures from the heart's blood and from the pleural fluid remained sterile. Smears from both lower lobes showed many Gram-negative bacilli and many Gram-positive diplococci. The lung cultures yielded a Gram-positive, bile insoluble, non-hemolytic streptococcus. This patient evidently had a combined influenza and streptococcus infection.

Discussion. The post-influenzal pneumonias may be due to a secondary invasion by any of the ordinary organisms producing pneumonia, but they are apparently more severe, more extensive and often rapidly fatal. The severity of the secondary infection seems to be augmented by the coexistent influenzal infection. The majority of the pneumonias here were due to a secondary invasion by pneumococci, all types contributing, but Types III and IV standing out more conspicuously than Types I and II. The streptococcus, both hemolytic and non-hemolytic varieties, were responsible for a small percentage of the pneumonias. So far as we could determine none of the pneumonias were due to the B. influenzæ alone, nor were we able to recover the B. influenzæ from any of the blood cultures or pathological fluids or exudates.

Summary. 1. The demonstration of B. influenzæ was possible in a large percentage of the patients from whom nose and throat cultures were made.

2. About 5.7 per cent. of the patients were also found to be hemolytic streptococcus carriers.

3. The bacteriological examination of the sputa from patients with productive coughs showed both B. influenzæ and pneumococci.

4. Examination of the sputum in the cases of post-influenzal pneumonia for type determination of pneumococcus (Avery method)

showed a preponderance of Type IV organisms with a relatively large number of Type III organisms.

5. Blood cultures were positive in about 50 per cent. of the pneumonia patients on whom cultures were made. Here again the high percentage of Type III and Type IV pneumococcus infection was in evidence. In no case was the B. influenzæ recovered from the blood either antemortem or postmortem.

6. The mortality in the pneumonias with septicemia was very high (88.8 per cent.). All patients with a Type III septicemia died.

7. Although the number of Type I cases was small and only four received specific serum therapy all of these recovered, though two were desperately ill when the treatment was started.

8. The relative number of hemolytic streptococcus cases was small; all of those with a septicemia died.

9. There were only two cases of pneumococcus meningitis. Both of these patients had pneumococci in the blood stream.

10. The empyemas have not differed from those following the ordinary pneumonias. The B. influenzæ has not been cultivated from any of the pleural effusions. Sterile pleural effusions have been of rather frequent occurrence.

11. The autopsies in the majority of cases showed a very extensive bronchopneumonia from which both B. influenzæ and pneumococci were recovered in smears and cultures. The postmortem blood cultures usually showed some type of pneumococcus.

Capt. O. T. Schultz, Lieut. Fitchet, Lieut. C. C. Patton, Lieut. G. W. Debold and Lieut. S. C. Clark assisted in making and examining the nose and throat cultures. Contract Surgeon E. O. Trahan and his assistants made all the type determinations for pneumococcus on the sputa. Lieut. Fitchet assisted in making and examining the blood cultures. Capt. O. T. Schultz performed all the autopsies.

Our thanks are due to Lieut.-Col. J. T. Burrus, Commanding Officer, Major Donald J. Frick, Chief of the Medical Service, and Capt. R. C. Henderson, Chief of the Laboratory, for their hearty coöperation.

THE TREATMENT OF EPITHELIOMA BY RADIUM.[1]

By Russell H. Boggs, M.D.,

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Methods of treatment of epithelioma in the past have been as numerous and the end-results as variable as the types and degrees of malignancy. Epithelioma is cancer of the skin or mucous mem-

[1] Read before the Westmoreland County Medical Society, May 6, 1919.

brane requiring treatment as such, and the center should never be removed by caustics or plasters or even partially surgically. Primary epithelioma is not a surgical disease, because, in order to remove all the cancerous cells, it is nearly always necessary to remove too much healthy tissue. The permanency of the end-results in the past few years in many thousands of cases has shown that radiation far surpasses any other method.

Radium is the best form of radiation locally on the lesion and in regions where glandular metastases are likely to take place. Radium used over glandular centers or junctions, with complete roentgen treatment over the tributaries, is far superior to the most complete and often unnecessary dissection. The dissection of the glands in the neck is seldom indicated for epithelioma of the lip, or for epithelioma of the mouth or throat, if thorough radiation is given. The glands should be considered trenches and the lymphatic vessels avenues for passage of the enemy or cancer cells. Thorough radiation will sclerose the lymphatic system and lessen the danger of metastasis as well as destroy the epithelial or cancer cells which have already escaped unless the process is too far advanced. And even in the advanced cases, radiation always retards rather than hastens the malignant process as a complete dissection often does.

During the past eighteen to twenty years the writer has seen a large number of cases of epithelioma of almost every part of the body treated by almost every method, and it is surprising how many apparently innocent-looking lesions were rendered hopeless in a short time by incompetent treatment. No difference what method is used a certain number of early cases will be cured if the treatment is properly employed, but experience has proved that when radiation is given with judgment a larger percentage of cases can be cured. However, it must be remembered that radium and the roentgen rays will produce a mild reaction to a slough, that a knife will cut away any amount of tissue, that a slough of any size can be produced by cautery or chemical agents and so on with the different methods; but it is only by judgment and experience that the best results can be accomplished by any method and its limitations determined.

While radiation has been the most advanced step made in the treatment of malignancy during the past twenty-five years, it is not a specific like antitoxin for diphtheria or salvarsan for syphilis, and it is not the positive and certain cure for which we have been looking. Unfortunately, until the last two or three years, almost every surgeon operated upon every case of malignancy, regardless of the stage, without first considering any other method. Time has made a marked change, and each year there is a smaller percentage of surgeons removing epitheliomas. The great drawback in the past has been that many who have had a roentgen-ray machine or a few milligrams of radium, without having had experience, attempted to treat malignant growths. I do not mean to say that surgery is

never indicated, but I believe that it is seldom if ever indicated in primary cases.

It is a well-known fact that if a lesion is completely excised a permanent cure will result, such as those on the cheek with a small amount of scar, but in a series of cases the end-results are better by radium without leaving any scar. In some locations, as the nose, eyelids, etc., the surgical operation is more difficult and the deformity is objectionable. The large and deep-seated lesions are always difficult for the surgeon to excise with all the outlying cells and should always have at least a preliminary treatment. One of the weaknesses in surgery is that in attempting to have a good cosmetic result there is the great possibility of leaving malignant cells. Cutting out the center of a malignant process primarily and leaving outlying cancer cells to be followed by radiation will not give results equal to those obtained by at least treating the case primarily with radium or the roentgen ray.

Caustics may be divided into three classes, namely, chemical agents, actual cautery or electric coagulation. These have a place only as an adjunct to radiation. Their chief use is to remove broken-down necrotic tissue which has first been treated and sterilized by radium or the roentgen rays, and are only necessary in far-advanced cases. Before they are ever employed the lymphatics should be at least partially blocked by some form of active radiation.

The therapeutic action of radium on new growth is manifested primarily on the nuclei of the cells and inhibits the power of proliferation before the function of the cell is impaired. There is also a change produced in the small bloodvessels. The endothelial cells of the intima degenerate, the lumen of the vessels retract, finally becoming obliterated, and consequently the tumor cells cannot obtain the nourishment needed for their maintenance of life and for their proliferation.

Embryonic cells and those undergoing active proliferation are the most susceptible to radiation. It has been shown that malignant, growths are retarded by radiation and become less malignant, although they may not have diminished in size or disappeared. By further increasing the quantity of radiation the injury becomes more pronounced and the cells are completely destroyed, the rays acting differently on the various types of cells, destroying one kind of tissue and leaving the other adjacent tissue intact or so slightly injured that it will completely recover. Cancer cells are from three to seven times less resistant than normal tissue, depending upon the type of the lesion. Squamous-cell epithelioma requires from two to four times more radiation to eradicate the disease than the basal form. A few years ago this fact led many to believe that the squamous or the more malignant form could not be cured by radium. The reason for this was insufficient treatment.

The term epithelioma in the past has been unsatisfactory, having been applied to all epithelial growths, semimalignant or malignant, regardless of the degree or situation, which fact has accounted for such a diversified opinion in regard to many innocent-looking lesions, which in time show a malignant and destructive type. Epithelioma has certain pathological characteristics; it is a purposeless proliferation of cells extending beyond normal limits and invading adjacent tissues, especially the lymphatics, with slight inflammatory changes.

When the student leaves college he has been taught there are three varieties of epithelioma, namely, superficial, deep and papillary; but it means very little to him, and he has only a vague idea of epithelioma and its treatment. As a rule epithelioma, in the early stages, does not seem to cause much alarm among the inhabitants of a community, nor even among many physicians, and for this reason many patients with lesions of the innocent-looking type come late after they have been treated by superficial caustics, and are in a hopeless condition. The disease comes on slowly, so slowy that often no one takes notice of it until it is far advanced. After the age of forty all lesions which are constantly inflamed and scaly or show any degenerative changes should receive prompt attention. Prophylactic treatment of all excrescences, such as warts or degenerated moles, the removal or correction of any irritation of the skin or mucous membrane, the proper treatment of cracked lip, persistent spots of eczema or leukoplakia, would often save the patient a long and expensive treatment and oftentimes the life of the patient. Precancerous changes should always receive prompt attention by the physician. From the therapeutic standpoint we must determine whether we are treating basal-cell epithelioma or a squamous-cell type. Rodent ulcer or basal cell is characterized by its steady and progressive spread and is usually observed on the upper part of the face about the nose and eyes. It is extremely destructive, eating deeply into the tissue; in fact, destroying everything in its way without any tendency toward metastases or glandular involvement.

We have four classes of epithelioma in respect to method of treatment: (1) the lesion which can be cured by one application of radium with the proper dosage; (2) the lesion which is so situated that glandular involvement is likely to take place or has already occurred and in which the roentgen rays should be employed as an adjunct to treat the adjacent glands; (3) those cases in which the local application of radium supplemented by the roentgen rays will only act as a palliative measure; (4) those cases in which radiotherapy should be followed by excision or fulguration.

On account of the nature of the cases, as well as the lymphatic supply, epithelioma of different locations will be described separately. The virulence of an epithelioma, increases or decreases proportionately with the richness or poverty of lymphatic supply. Before

giving a prognosis of epithelioma, besides the location, several factors must be taken into consideration, namely, variety, extent, duration and rapidity of process. In many superficial forms the disease if neglected is slow in its progress, but eventually it will become dangerous to life if left untreated. In all instances the treatment should be given early, because it then requires less radiation and there is less chance of return. In the early stages, when the disease is limited to the face and of the superficial type, the treatment is almost invariably successful and permanently so. In this location, even when moderately advanced, the results are favorable in a large percentage of cases, but it requires so much more treatment. Good results are obtained in the deep-seated and papillomatous forms in the early stages, but in these cases glandular involvement occurs early.

The prognosis is not so favorable in epithelioma in which marked destruction has already taken place and in which there is considerable infiltration of the surrounding tissues, particularly so if the glands are invaded.

The basal form of rodent ulcer is amenable to treatment, but when left untreated or treated improperly is always of a serious nature, because this type of epithelioma seldom invades glands but destroys everything in its way.

Epithelioma of the upper part of the face, when the lesion is small, will usually respond to one application of radium. In epithelioma of the eyelids radium can be brought in contact with the lesion and there is little or no danger to the eye, and before the cartilage is invaded a small amount of radium will effect a cure. Recurrent lesions which have been treated by caustics are very resistant because the cartilage is usually involved and the infiltrated scar does not respond so promptly. The cosmetic results in the primary cases which have not been treated by caustics are frequently surprisingly good even when the lesion is rather extensive. The resultant scar is smooth, pliable and not thick and elevated like that following caustics or even a cutting operation.

Results in the treatment of epithelioma of the lower lip by radium, supplemented by the roentgen rays, are proved equal or superior to those obtained by surgery. This is a perfectly legitimate method of treatment, but must be carried out thoroughly. It is liable to abuse, however, the same as surgery has been in the past. Epithelioma of the lower lip is always a serious condition, and when radiation is given it must be employed in such a manner as to destroy all the cancer cells in the local lesions and in the adjacent lymphatic glands. With efficient treatment over 90 per cent. of the early cases are permanently cured without producing any deformity, more advanced cases are cured and hopeless cases receive retardation and palliation which cannot be accomplished by any other method.

In my opinion surgery, in most instances, should be reserved for

advanced cases and then only in cases after the cancer cells in the local lesion and glands draining the lip have either been entirely destroyed or in cases in which only a few cancer cells remain which are not very malignant in character. In advanced cases usually it is better not to push radiation up to a point where the superficial tissue will undergo a marked degeneration or a necrosis. It is much better to use a combination of methods and have the lesion removed surgically or by fulguration after it has been radiated and then follow up the treatment again. Radium has the advantage of not leaving a contracted scar which so frequently follows the removal of a V-shaped portion of the lip and in which a recurrence frequently takes place. Even with the best surgery a large amount of contraction takes place and later the movement of the mouth often irritates the scar and is undoubtedly the cause of the recurrence. We know that irritation is the cause of cancer in the healthy tissues, and once the lip has been invaded by cancer cells this is more likely to occur.

Before treating epithelioma of the lower lip a careful study should be made of the lymphatic glands and the manner in which they metastasize. The lymphatics draining the lower lip are the submental, which receive the lymphatic vessels from the chin and the central portion of the lower lip and the submaxillary which receive the lymphatics of the lateral portion. The submaxillary salivary gland is closely connected and often metastasizes. There is an anastomosis between the lymphatics which drain both sides of the lower lip as well as those draining the central portion. This must be remembered when radiating the lymphatics of the neck. The deep cervical chain extends from the mastoid process to the clavicle; some of the glands lie behind the internal jugular and subclavian veins and cannot be reached surgically without the removal of the jugular. The cervical glands metastasize from the submental and submaxillary. When the submental and submaxillary are palpable some cancer cells usually have reached the deep cervical chain. Early invasion of the lymphatic chains must be realized, and treatment by radiation must be given as carefully as a radical operation is performed. The writer has seen many cases of epithelioma of the lower lip in which only the lesion on the lip received treatment and in which at the same time the lymphatic glands were involved.

The objection to surgical removal is the frequent recurrence in the scar, because the operation on the glands cannot be sufficiently complete, no matter how thoroughly the dissection is carried out. The removal of the submental part of the parotid, submaxillary and all the glands which metastasize, together with the ligation and excision of the jugular is no easy task; besides, often leaving cancer cells in deeper glands which cannot be reached.

Today the radiotherapeutist has seen early cases in which a diagnosis is yet questionable; he has seen cases a trifle more advanced after radical operation in which he administered prophylactic

radiation as well as in many hopelessly inoperable cases. He not only sees more cases in a year than any individual surgeon of equal standing and reputation, but he works earnestly over many cases after they have been abandoned by the family physician, dermatologist and surgeon. He is in the best possible position to compare different methods of treatment from the standpoint of ultimate results. In short, he has a broader clinical knowledge of the subject than any other physician.

When ulceration has taken place, early surgical removal, wide and radical, is followed by recurrences in more than 50 per cent. of the cases in which there are no palpable glands at the time of operation and in more than 75 per cent. in which there is any glandular involvement. All precancerous lesions should be removed by some method without leaving any scar whatever.

Results in the treatment of malignant growths of the mouth and throat have not been successful by the older methods. When removed surgically even the smaller lesions are prone to recur; cautery in selected cases may give slightly better results and the end-results obtained by those using radium alone, such as the radium institutions, are not much better except in the early cases. The pessimistic tone of the reports from the London radium and other institutes must be discounted when it is recalled that most of these institutions treat only inoperable cases, and with radium alone. Radium, except in the early cases, should be combined, with other suitable measures, in order to obtain the best end-results.

In all examinations of the mouth and throat, precancerous lesions, such as leukoplakia, should always be looked for and treated promptly. Many of the earlier epitheliomas, before they have invaded the deeper tissues, will respond to one application of radium. It is to be remembered that the persistent lesions in the mouth and throat are nearly always malignant or luetic. Superficial cautery seldom removes a malignant lesion and nearly always hastens metastases.

I am sorry to say that so many cases are referred after superficial cautery has been employed in which the growth has not only been aggravated but deep metastases have taken place. Many physicians, not realizing the malignancy of these lesions, will often try cauterization or some inert mouth-wash, allowing the disease to become far advanced before they refer their patients to a laryngologist or for radium treatment. There is no place where it is more important to have early and proper treatment than in the mouth and throat. The selection of the method depends not only on the location and extent of the lesion but also on the experience of the operator or the radiotherapeutist. Roentgenization of the lymphatic glands should always supplement radium therapy as described for cancer of the lip.

No difference what method is employed a preliminary application

of radium in advanced cases is always of great service, as we have no other agent which destroys cancer cells to the same extent without injury to healthy tissue. Preradiation, in fact, makes cancer cells latent by stopping cell-proliferation early in the treatment and prevents spreading of the disease when other procedures are employed.

Electric coagulation or fulguration is a method which I have employed, after a preliminary treatment of radium to the growth in advanced cases and roentgenization of adjacent lymphatic glands, with some excellent end-results, even in advanced cases. The advantages of electric coagulation are the destruction of tissues without opening the blood- and lymph-vessels and the prevention of dissemination which might occur with a cutting operation. The large amount of carcinomatous tissue which can be destroyed by electric coagulation without hemorrhage is an item of great importance, which compels serious consideration by those who have treated many malignant cases. I have a few cases of advanced or inoperable carcinoma, including the floor of the mouth, buccal mucous membrane and tonsils, which were clinically cured by giving preliminary radiation followed by electric coagulation, and will be reported later.

Recurrences in the cicatrix and the glands frequently follow even when the tumor has been completely excised in its early stage. So frequently is this the case that we are bound to conclude that in many cases it is regional and not entirely local from the beginning, even before the neoplasm is scarcely recognizable by the naked eye, because the whole of the lymphatic circulation as well as the glands are already infected.

Delay in treatment of epithelioma of the mouth is not wholly responsible for the unsatisfactory results by surgery or even by any method in a certain percentage of cases. However, in these cases, in equal stages, the character of the end-results by radium surpasses the results by any other method. When patients have a very unhealthy mouth the gums are retracted from the teeth and there is more or less pyorrhea, the teeth are loose, and the whole mouth gives the appearance that the patient is suffering from lead-poisoning. The same results must not be expected as when the mucous membrane surrounding an epithelioma is healthy and the tissue has the usual normal resistance. Such cases often do badly by any method and the process is only retarded for a time by radiation. Also, as good results must not be expected in a luetic mouth as in a healthy patient.

Epithelioma of the back of the hand usually responds to treatment, but the prognosis is not so favorable as with the ordinary face cases, because the axillary glands are often early invaded. Therefore small lesions should have prompt and thorough treatment. No one realizes this better than the roentgenologists who have had keratosis on their hands. Some authorities state that progress in

epithelioma in this situation is slow and there is less liability of grave ulceration than epithelioma in other situations. This has not been my experience entirely. They have been usually slow in progress, but the lymphatic glands were invaded in many cases that I have seen at the time they were referred. Therefore, even the axillary glands should receive treatment.

Epithelioma of the genitals is always a serious matter, although with the proper treatment in the beginning the results are often successful. Left untreated until far advanced, palliation is all that can be expected from any form of treatment.

Paget's disease or eczematous epithelioma of the nipple is classified by most dermatologists under epitheliomatosis or carcinoma of the skin. It is like superficial epithelioma, the onset is slow and the condition suggests an eczematous involvement of the areola of the nipple. The process begins with a moderate inflammation exhibited as redness and scaling involving the nipple areola. Murphy called attention very forcibly in the *Year's Progress of Medicine and Surgery*, 1915, that Paget's disease is cancer from the very first, and that even in the early cases there was a mortality of over 90 per cent. of cases even when submitted to surgical operation. I have treated cases of Paget's disease by radiation alone and have patients clinically cured for over ten years. This corresponds with the experience of many others. The treatment should consist in radiation not only applied locally, but the adjacent glands should be treated as thoroughly as it is given postoperatively for carcinoma of the breast. If these cases are treated early, when there is only the eczematous condition present, and treated thoroughly, the results are rather uniform. It is to be remembered in all cases there is no attempt at repair, and, when abandoned to its course, the ultimate result is a profound ulceration with the destructive effects most noticeable in the region of primary invasion, the entire breast becomes cancerous and invades the lymphatics. It is to be remembered that local treatment suggested for eczema has no effect on this condition.

CEREBRAL HEMORRHAGE OF THE NEWBORN.

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Since earliest times the traumatism undergone by an infant during the process of birth has been recognized and deplored. This is, of course, especially marked in long or difficult labors, and we have become only too familiar with the severe injuries which may result

from this cause. The most common of these has been naturally head injury, associated with hemorrhages which often have been considered as a cause of stillbirth or death during the first few days of life. But, although recognized as a theory, on reviewing the literature one finds very few statistics founded upon detailed autopsy reports in cases of cerebral hemorrhage of the newborn. Although a subject of vital interest and fundamental importance to the obstetrician, pediatrician and pathologist it seems to belong to none and to be neglected by all.

Little, in 1861, was the first to emphasize birth injuries, and their results in later life, as shown by the development of impaired mentality or the palsies or contractures in older childhood. But as at that time the effects of pressure on the cortex was but imperfectly understood, it was left to Sarah McNutt, in 1885, to establish the relationship between cerebral hemorrhage at birth and Little's disease of later life. This was done by autopsy reports on 10 carefully studied cases. Of these 10, 7 were vertex and 3 breech presentations, showing that prolonged pressure on the head is not always responsible for the condition. Of the 7 vertex presentations 5 showed hemorrhage over the cerebrum and 2 below the tentorium. The hemorrhage in the breech presentations was over the cerebrum in all 3.

Of the occurrence of cerebral hemorrhage as compared with other causes of death in infants only meager information is found Holt says that one-third of all deaths during or as the result of parturition are due to hemorrhage, but gives no exact numbers based on autopsy findings. Cushing found that in studying stillborn infants for another purpose, many showed cerebral hemorrhage. From the Pathological Institute of Kiel, Weyhe reported that in 959 autopsies on infants 122, or 12 per cent., showed intracranial hemorrhage. In 80 of these cases the hemorrhage was subdural, in 56 subarachnoidal, in 35 intracerebral and in 21 intraventricular. Of these 122 cases 23 showed evidence of congenital syphilis. Döhle found hemorrhages occurring in 13.7 per cent. of his series. Beneke observed in 100 autopsies on the newborn laceration of the tentorium resulting in hemorrhage in 14 cases. Osler quotes Litzmann as finding 35 cases of hemorrhage in 161 autopsies, Parrot as noticing bleeding in the subdural space 26 times in 34 autopsies of the newborn and Spencer finding in 130 postmortem examinations on stillborn infants 53 cases with hemorrhage under the pia-arachnoid. Sachs in autopsies on 78 cases of infantile hemiplegias noticed hemorrhage in 23. Couvelaire saw intracranial bleeding in 18 per cent. of autopsies on prematures born with easy and spontaneous labors. Archibald reports in 74 postmortem examinations that intermeningeal hemorrhage occurred in 32, and this hemorrhage was extensive in 19 and extradural in 5.

Isolated cases confirmed at the autopsy table are quite numerous

in the recent literature, especially since Cushing's article describing operative procedure for the relief of the condition. Green describes 1 with blood over both hemispheres and at the base along the crura and pons, 1 other with clots over the right hemispheres and 2 more with bleeding over the cerebrum accompanied by hemorrhages in other organs. Eastman reports 1 case with bleeding in both ventricles. Torbert had 2 cases, both with hemorrhage over the cerebrum. Simmons saw 2 cases with the same distribution. Others are given by Cushing and Meara and Taylor.

Every pathologist familiar with autopsies on the newborn has noticed, even without massive bleeding in any organ, numerous small punctate hemorrhages occurring especially over the epicardium and the parietal pleura. Paul finds these same hemorrhages in the retinæ of the newborn during life. In 200 examinations he noted hemorrhage in the retina in 20 per cent. of children born with a normal labor, 50 per cent. of prematures and 40 per cent. of those from complicated and prolonged labors. In view of these findings the assumption is justifiable that young infants' bloodvessels are particularly delicate and susceptible to rupture from injury.

As to the etiology of these hemorrhages one finds as many theories suggested and advanced as there are authors. All agree, however, that the condition is as frequent in cases of normal or precipitate delivery as in difficult labors. It has also been shown that hemorrhage may occur even before birth. Gibb reports a child born with contractures of one arm and leg and an old blood clot above the lateral ventricle, while the mother gave a history of trauma. Osler found in an autopsy on a woman dying of typhoid in the seventh month of pregnancy a fetus containing a large hemorrhage in the brain. Seitz quotes another case in which a macerated fetus delivered spontaneously had a hematoma the size of a walnut in the brain hemisphere.

Kreyberg thinks that a long time elapsing between the birth of the head and shoulders is an etiological factor, while La Letra states that hemorrhage frequently follows asphyxia caused by the cord being twined about the neck. Benthin suggests that it may be caused by too great pressure on the perineum. Beneke points out that during severe labor pains the pressure is often on the sides of the head, increasing its long axis, pressing the brain forcibly against the tentorium and causing tearing of its radiating fibers. He further explains that this tear may be of the anterior, posterior or middle layer, and therefore may cause bleeding over either the cerebrum or cerebellum. But Seitz, after a careful study in which he cut serial sections of the head and its contained brain, concluded that although one-half of his cases confirmed Beneke's theory the other one-half excluded tentorium injuries as a cause and pointed instead to injuries of the vessels over the brain. He therefore groups all of these cerebral hemorrhages into three divisions: (1) hemorrhage

over the cerebrum (one or both hemispheres) from injury to the longitudinal sinus or the vessels emptying into it; (2) hemorrhage under the tentorium around the cerebellum, due to injuries to the transverse sinus or tributary vessels; (3) hemorrhage into the lateral or fourth ventricles, due to the tearing of the veins of the choroid plexus. The last group is evidence against the theory of tentorium injury being the only cause of cerebral bleeding.

Abels places the causes under two groups: (1) Tearing of the vessels due to molding of the head in such cases, as contracted pelvis, forceps deliveries, etc.; (2) backing up of the blood in the sinuses and veins in asphyxia. He points out that during labor the pressure on the fetus is raised in the uterus, and especially before the membranes are ruptured, is evenly distributed, thus causing no congestion or stasis of the blood in the child's head. But when the head is born it is released from the uterine pressure still acting on the body, and the result is a marked congestion or stasis of the bloodvessels of the head. Since the skull cannot expand to any marked degree the delicate-walled veins on the surface of the brain may become extremely engorged and often rupture. The sutures permit of some expansion, and Abels thinks that this is the reason hemorrhage is rarely found in the neighborhood of the sutures.

Cushing adopts the same classification as Abels and says that rupture may be possible in marked asphyxia, just as it may be possible in later life in a paroxysm of whooping-cough or a convulsion. He also notes the frequency of rupture of the veins at the point of entrance into the longitudinal sinus and points out that in infants there are no adhesions between the dura and cerebral hemispheres, thus leaving these veins unprotected and in a position to be easily displaced or torn by the overriding of the parietal bones during the molding of the head.

Seitz made an effort to find the etiology of cerebral hemorrhage in the newborn by making a careful analysis of the 13 cases which came under his observation. Of these infants he found 5 to be below and 8 above average weight, suggesting oversize as a possible etiological factor. Of the 13 mothers 7 were primipara, and of these 4 were over thirty years of age; 6 were multipara, and of these 4 had borne many children. One-fourth of the mothers had a contracted pelvis, but in none was it marked. Of the 13 deliveries forceps were used 10 times, leaving only 3 spontaneous births; 11 of the 13 babies were born asphyxiated, 5 to a mild degree and 6 to a marked degree. However, of the 3 unaided deliveries 2 breathed spontaneously, all 3 mothers were multipara, none had narrow pelves, none had lues, the births were all rapid and the cervices all quickly and completely dilated. In view of these facts the explanation of the occurrence of the hemorrhages becomes exceedingly difficult or obscure. But all three babies were large, so Seitz reaches the con-

clusion that although dilatation appeared complete it was not sufficient for children so large, and in the rapid delivery the head was too quickly molded and injury to the veins was the result.

All authors agree on the predominance of bleeding over the cerebrum, usually limited to one side. It is also frequently pointed out that the child may appear normal for the first few days and then develop cerebral symptoms. Kundrat thinks that many of these infants recover from hemorrhage resulting from birth trauma without developing any symptoms, for in autopsies on children several weeks old he has found old pigment in the meninges and other signs of old extravasated blood. Meara and Taylor warn against "jack-knifing" as a means of artificial respiration, on the ground that it increases the distention of the cerebral vessels already engorged by the asphyxia. This assumption is given greater weight by the occasional discovery of subdural and extradural hemorrhage in the spinal column following such manipulations. But to Green belongs the credit of first suggesting hemorrhagic disease of the newborn as a cause of cerebral hemorrhage.

In the pediatrics service at the University Hospital during the last three years 36 routine autopsies have been performed on stillborn babies or those dying early in infancy. In this series 18, or 50 per cent., showed definite hemorrhages in the dura, over the brain or in the ventricles. Of the 18, 10 occurred in females and 8 in males. If one takes Seitz's figure of 3200 grams as the average weight of a full-term child, of our 18 cases 11 were of average weight or below and only 7 above. Of the 18 mothers 11 were primiparæ of these 11 only 1 was over thirty years, 1 was twenty-nine and the remaining 9 were twenty-four or under. Of the 7 multiparæ 2 were second labors, 1 was third, 1 was fourth, 1 was fifth, 1 was eighth and 1 was ninth. Forceps were used but once, and then in the case of delivering a mother, critically ill with pneumonia, of a six months' fetus. In only 2 cases was the labor very long, and in both of these cases twins were born, in each instance the first one remaining normal while the second showed cerebral hemorrhage. Of the 18 babies only 2 were born dead and 4 exhibited signs of asphyxiation, while the remaining 12 breathed spontaneously, thus excluding mechanical asphyxia as a major factor in this condition. Only 2 infants appeared normal at and following birth, the others showing respiratory symptoms from the very first.

One very interesting point, however, is that in 8 of these infants gross hemorrhages were found in other organs besides the brain. It thus appears quite clear that in a fairly large percentage of cases showing intracranial hemorrhage such lesions are merely incidental to a general hemorrhagic diathesis, the syndrome being usually grouped under the heading, "Hemorrhagic Disease of the Newborn." Five of the 8 vomited blood before death and showed an increased coagulation-time of the blood. Of the 3 remaining cases without

clinical symptoms 1 revealed besides the hemorrhage over the brain an extravasation of blood into the right adrenal, another, massive hemorrhages in the lungs and the third hemorrhages in the pericardium and skin. These facts emphasize the value of routine estimations of the coagulation-time on the blood of newborn infants. Early recognition of decreased coagulability of the blood and prompt treatment of such cases by the injection of whole blood or serum might obviate otherwise fatal hemorrhages in the brain as well as other organs. Of the two small twins each born alive after its fellow the condition cannot be explained on the ground of overweight or of only partially dilated cervix, but one showed massive hemorrhage in the lungs as well as over the brain and the other was definitely, clinically and anatomically hemorrhagic disease.

Kundrat points out that partial atelectasis of the lungs is always associated with cerebral hemorrhage and is almost pathognomonic of it. While our necropsy findings show that the two conditions are associated, atelectasis of varying degrees was also found in infants not showing cerebral hemorrhage. Hence, as partial atelectasis may be explained by the short period of life, asphyxiation or prematurity, it may be considered as, at the most, merely a contributory and not as a primary condition.

The location of the hemorrhages of the series of cases from the University Hospital conforms well with other observations given above. In this series hemorrhage over the cerebrum and limited to one hemisphere occurred six times; over the cerebrum, cerebellum and in the dura three times; over the cerebrum, cerebellum and in the ventricle once; over the cerebrum and cerebellum three times; over the cerebellum once; in the dura alone only twice; and in the ventricles alone twice. Hemorrhage over the cerebrum either alone or with other parts of the brain is found in a total of 13 cases, or 72 per cent. In only 2 cases was softening of the brain under the hemorrhage noted, and this occurred in the oldest in the series, an infant of five days, and in a premature one month of age. In the other cases doubtless death occurred before degenerative changes could take place in the brain substance. In no case was gross hemorrhage into the brain substance found. None of these infants showed any signs of congenital syphilis, and only one mother gave a positive Wassermann reaction. Only four were born prematurely. The high percentage of hemorrhages in these cases may be partially due to the fact that very few emergency or acutely ill patients are admitted to the University Hospital, so that the list therefore includes few acute diseases of either mothers or infants and is limited to births occurring in the hospital.

When confronted by the resumé of the literature and the analysis of the cases give above, one is impressed by the comparative frequency of occurrence of cerebral hemorrhage in newborn infants and also by the number and confusion of the etiological factors

claiming attention. A classification of the various causes which have been proposed will emphasize this latter fact and also form a basis for a discussion of their relative merits. They may readily be divided into three main groups:

I. Traumatic: from molding the head, either in normal or precipitate deliveries.

1. Over the cerebrum:
   (*a*) Due to injury of the longitudinal sinus or its tributary vessels.
2. Below the tentorium:
   (*a*) Due to injury of the transverse sinus or its tributary vessels.
3. In the ventricles:
   (*a*) Due to injury of the choroid plexus.
4. In the dura.
   (*a*) Due to elongation of the head with pressure of brain against dura and tentorium.

II. Congestion or stasis with rupture of veins in protracted or complicated labor due to:

1. Malpresentations.
2. Overgrowth of child.
3. Twins.
4. Umbilical cord around neck.
5. Rigid cervices in primipara.
6. Prolongation of the interval between the birth of the head and that of the shoulders.

III. A diseased condition of the child in intra-uterine life and having no relationship to labor, such as:

1. Hemorrhagic disease of the newborn.
2. Prematurity.
3. Syphilis.
4. Congenital heart disease.
5. Other toxemias.

Considering the subject as a whole it becomes at once clear that the most frequent source of this bleeding, regardless of cause, is rupture of the superficial veins which pass over the surface of the brain into the longitudinal sinus. This may be explained by the fact that these veins are in a comparatively unprotected position, and hence more susceptible to injury from either displacement or abnormal distention. Of all vessels in the body these are the ones most exposed to the injuries and accidents of labor and birth.

The first division of the above classification represents, theoretically at least, one of the most common causes of injury, *i. e.*, overriding of the parietal bones and resulting displacement and laceration of the veins. For this condition even an abnormal labor is not necessary, and it frequently is most marked in normal deliveries, especially those which are rapid or precipitate. In fact, the more

rapid the delivery the less chance do the brain and vessels have to adjust themselves to the changed relationships and the greater tendency there is to injury. This point is emphasized in the 18 cases cited above in which only 2 showed a prolonged labor. In the overriding of the parietal bones the condition is naturally the most marked on one or the other side, and as a result the hemorrhage is frequently limited to one cerebral hemisphere, as was noted in 6 cases of our series. Of less moment, perhaps, but following the same principles, the changes in the relation of the occipital bone to the parietals may account for hemorrhages over the cerebellum, and perhaps in certain cases even those originating from rupture of the choroid plexuses. The hemorrhages in the dura only may be accounted for by injury to the tentorium or dura, either by laceration of their fibers or of their capillaries in the twisting or elongation to which the head is subjected in its passage through the birth canal. The use of forceps is often advanced as an explanation of these hemorrhages, but one finds in the 18 cases analyzed above that forceps were employed but once, and then in a very easy delivery. There is little doubt that this factor has been greatly overemphasized. Their usual position in this category may be due to a confusion of the ideas of cause and effect. The harm is doubtless done in many instances not by the mechanical injury of the forceps themselves, but by congestion or asphyxiation due to the protracted or complicated labor which caused the attempt at artificial aid to delivery.

The second group includes those cases in which labor is prolonged and the resulting congestion and overdistention of the veins lead directly to hemorrhage or indirectly to rapid degeneration and subsequent rupture, just as in later life undue dilatation of a cerebral vessel may result from a paroxysm of whooping-cough or a convulsion. Narrow pelves, malpresentations or an abnormally large child are self-explanatory factors in producing mechancial obstruction to normal birth of the infant. The constriction of the neck by encircling with the umbilical cord is also a fairly common cause of asphyxiation. A long time elapsing between the birth of the head and that of the shoulders may result in a marked congestion of the cerebral veins, due to the fact that while the head is free the body is still subjected to uterine pressure and the blood is forced out of the body into the head. In the case of twins the first child may be normal while the second, even though delivered quickly, will show marked congestion because of too long delay in birth. In respect to primipara it is interesting to note that in the cases above cerebral hemorrhage occurred more frequently in young primipara mothers than in older ones. The difficulty here is doubtless due to rigidity of the cervix, with resulting slow and imperfect dilatation in the first labor, and this occurs in young as well as older women.

In the third group of cases the cause of the hemorrhage undoubtedly is in the fetus and has little or no relationship to the process of

labor itself or the conditions accompanying birth. In this division hemorrhagic disease of the newborn deserves by far the most important place because of the comparatively large number of deaths with cerebral hemorrhage showing this condition. It accounts for the death of 8 of the 36 cases in our series. One is justified in emphasizing the importance of this disease because of the fact that it has been largely disregarded in the past. Prematurity, while not an actual disease, is placed here because it represents a pathological condition of the child rather than of the mode of birth. Underdevelopment of the body as a whole naturally includes abnormally delicate bloodvessel walls and hence greater liability to rupture from any cause. Moreover, the conditions which have produced a premature birth are often those which have also brought about pathological changes in the tissues, including the bloodvessels, and this has increased the possibility of accident. It is important to note in this connection that nearly one-fourth of the autopsies in our series of cerebral hemorrhages were on premature infants.

Syphilis is perhaps given undue importance as an etiological factor. In none of the 18 cases of our series was there any evidence of this disease. Weyhe claims a place for it, and the importance of syphilitic degeneration of the vessel walls cannot be denied as a possible cause of early rupture. As a rule, however, the disease itself usually accounts for the death of the child and cerebral hemorrhages do not appear to be a common complication. The influence of congenital heart disease, particularly those forms which interfere with the development of a normal extra-uterine circulation and the resulting abnormal congestion thus produced, is a self-evident cause of the occasional appearance of complicating and intracranial hemorrhage. This point is well illustrated in one of our series in which the heart presented an absence of the interventricular septum, and from this common ventricle only one arterial trunk carried away the blood destined for both pulmonary and systemic circulation, the mixture of which must unavoidably lead to profound asphyxiation.

Lastly under this heading must be placed certain cases in which the exact cause of the hemorrhage is by no means clear but in which a diverse group of intoxications occurring in the mother may reasonably be assumed as having an important relation to antenatal degeneration and weakening of the vessel walls. An example of this was, in our series, the small six months' fetus, quickly delivered from a mother dying of lobar pneumonia, which showed marked cerebral hemorrhage.

In conclusion, a general consideration of cerebral hemorrhage in newborn infants emphasizes two very important facts: (1) that the condition is often a complex disease syndrome giving rise to diverse clinical symptoms, modes of death and pathological findings, and (2) that it is not brought about by any single cause but by an inter-

relation and interaction of a varying number of causes which may be found in the circumstances governing labor in the condition of the mother or of the child. Several causes may often be present, any one of which in itself might have been the responsible factor.

SUMMARY. 1. Cerebral hemorrhage of the newborn is frequently found, occurring in 50 per cent. of 36 deaths of young infants at the University Hospital.

2. The condition is brought about by trauma in normal or rapid deliveries, by congestion or asphyxiation in slow deliveries or by disease of the child itself.

3. The so-called "hemorrhagic disease of the newborn" is a much neglected but very important cause of cerebral hemorrhage in infants, occurring in 44 per cent. of the deaths of our series.

4. Forceps deliveries, advanced age of the primipara mother and syphilis probably do not play as important a role in the etiology of this condition as was formerly supposed.

5. More careful and complete routine autopsies on newborn infants as well as more accurate observations on the conditions of the mothers and circumstances of the birth are needed as a foundation for further studies.

I am indebted to the department of pediatrics for obtaining permission for these autopsies and to the department of obstetrics for their careful records on their parturition charts.

BIBLIOGRAPHY.

1. Abels: Zur Genese und Symptomatologie intrakranieller Blutungen bei Neugeborenen, Arch. f. Gynäk., 1913, xcix, 1.

2. Archibald: Am. Pract. Surg., 1909, v, 208.

3. Beneke: Tentoriumzerreissungen bei Geburt, Münch. med. Wchnschr., 1910, pt. II, lvii, 2125.

4. Benthin: Intrakranielle Blutungen infolge Tentoriumzerreissung als Todesursache bei Neugeborenen und Säuglingen, Monatssch. f. Geb. u. Gynäk., 1912, xxxvi, 308.

5. Couvelaire: Hémorrhages du Système Nerveux central des Nouveau Nés dans les accouchements terminés par les forceps, 1907, series 4, ii, 7.

6. Cushing: Intracranial Hemorrhage of the Newborn, AM. JOUR. MED. SC., 1905, cxxx, 563.

7. Döhle: Ueber chronische Pachymeningitis bei Kindern und deren forensiche Bedeutung, Verhandlung S., Xth Internat. Med. Congress of Berlin, 1890, v, 40; Pt. XVII, p. 40.

8. Eastman: Intraventricular Hemorrhage of the Newborn, Boston Med. and Surg. Jour., 1913, clxviii, 165.

9. Green: Intracranial Hemorrhage in the Newborn, Boston Med. and Surg., Jour., 1914, clxx, 682.

10. Gibb: Lancet, 1858, vol. ii.

11. Holt: Diseases of Infancy and Childhood.

12. Kreyberg: Apoplexy bei Neugeborenen, Medicinsk revu, 1890, p. 102.

13. Kundrat: Ueber die intermeningealen Blutungen Neugeborener, Wien. klin. Wchnschr., 1890, iii, 887.

14. La Fétra: A Case of Cerebral Hemorrhage, with Operation, Am. Jour. Obstet., 1909, lx, 340.

15. Little: Tr. Obstet. Soc. of London, 1861, iii, 293.

16. Meara and Taylor: A Case of Cerebral Hemorrhage, with Operation, Arch. Ped., 1909, xxvi, 846.

17. Osler: Modern Medicine, 1910, vii, 357.
18. Paul: Ueber Augenspiegelbefunde bei Neugeborenen, Inaug. Diss., Halle, 1900.
19. Sachs: Nervous Diseases of Childhood, 1905, p. 449.
20. Seitz: Ueber die Genese intrakranieller Blutungen bei Neugeborenen. Zentralbl. f. Gynäk., 1912, xxxvi, 1.
21. Seitz: Ueber Hirndruck Symptome bei Neugeborenen in Folge intrakranieller Blutungen und Mechanischer Hirninsulte, Arch. f. Gynäk., 1907, lxxxii, 529.
22. Simmons: Two Cases of Intracranial Hemorrhage in the Newborn, Boston Med. and Surg. Jour., 1912, clxvi, 43.
23. Torbert: Intracranial Hemorrhage of the Newborn, Boston Med. and Surg. Jour., 1909, clx, 500.
24. Weyhe: Ueber die Häufigkeit von Hemorrhagien im Schädel beim Säuglingen, Inaug. Diss., Kiel, 1889.

PNEUMOHYDROTHORAX.[1]

By James I. Johnston, M.D., F.A.C.P.,

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The teaching clinician of two decades ago found in pneumohydrothorax an opportunity for one of his finest demonstrations of pulmonary physical signs. Da Costa and Musser, without thoracic roentgen-ray aid, presented the striking signs of this condition with great exactness; but we, their pupils, seem to have either forgotten this result of pathological destruction to the lungs, or else pneumohydrothorax is not so common as formerly. This latter view one cannot but feel is possibly true, and for two reasons: (1) due to the elaborated work on tuberculosis, early infections are recognized, patients are brought to a state of cure and saved in great numbers from the late stages of pulmonary destruction; (2) those cases that do go on to advanced pulmonary disease receive better care in the cavity stage. It is generally accepted that 90 per cent. of all cases of pneumohydrothorax are due to advanced pulmonary tuberculosis. One cannot but pause here to emphasize again what most progressive internists still stand for, namely, that physical signs are of the first importance and their interpretation of the utmost value, even with our plates, fluoroscope and laboratory studies, desirable as they are and useful as adjuncts. Pneumohydrothorax is a conspicuous example of this.

Hoover called the attention of the Interurban Clinical Society some years ago to a sign in thoracic diseases which impressed us very much and which, like him, we continue to teach our students. This sign, simple in itself and easy of application, shows well the movement of the diaphragm, and is far superior to and easier of demonstration than either the so-called Litten's diaphragm phenomenon or possibly the fluoroscope. We have never seen this sign explained in print, but if not recorded it well deserves to be so placed. The diagnostician

[1] Read before the Allegheny County Medical Society, April 16, 1919.

places his two thumbs at the most prominent parts of the sides of the thoracic costal angle, usually where the ninth rib joins by its cartilage the sternum, with the rest of each hand enfolding the sides of the lower thorax on either side. The excursions of respiration exaggerated by the patient, when possible, allow the movements of the thumbs to be studied, whether outwardly, even, equal or actually drawn in toward the middle line. The findings from this observation show any interference of the diaphragmatic range, if present, and point to the side of thoracic pathology, whether from pain, fluid, consolidation or adhesion. In our cases of pneumohydrothorax this sign was marked, and in all our chest work it is exceedingly valuable. One other sign must be mentioned here, which is frequently if not commonly misunderstood, and for the recent emphasis of which credit is also due to Hoover. This was also marked in our cases of this condition, namely, the presence of bronchial breathing, heard best by the ear next to the naked chest. Such bronchial breathing is always heard over pleural effusions as well as over consolidations, a fact usually disassociated in the average physician's mind because of the idea of the intervention of another medium between the lungs and the parietal pleura.

Assuming as correct that 90 per cent. of cases of this pathological entity are due to previously established pulmonary tuberculosis, such a history of previous infection and often of pulmonary destruction must be given great weight; but more striking is the history of a sudden pulmonary accident occurring in such cases. Both of our recent cases due to tuberculosis gave a history of sudden pulmonary pain and distress accompanied by sudden orthopnea and cyanosis definitely fixed, and both were cases from sanatoria for pulmonary tuberculosis in a state of presumptive benefit and quiet. The pathognomonic signs of amphoric breathing, unilateral basic impaired resonance, tinkle, coin test, succussion splash, etc., are well known and need no repetition here. Suffice to say that they were all present in the cases forming the bases of this paper, and should patients survive the initial stormy onset, are usually found. The prognosis is an important element; a very small percentage are said to recover, although most patients live for a few weeks following the pulmonary rupture. This was true in our cases. A fatal outcome and in a short period is the proper stand to take. We were able to make a roentgen-ray study of one of these cases, and the plates clearly revealed the facts which the carefully worked-out physical signs and history had already impressed upon us. A fluoroscopic study, when possible, would be an attractive confirmation, and, we think, of the greatest value.

The first of our cases, seen in a small town in consultation, presented the picture of orthopneic distress with great cyanosis, which had been present for two weeks. The history was that of sanatorium residence, allowed home in a state of non-activity

and then of a sudden pulmonary accident, followed immediately by great dyspnea and cyanosis, attributed at the time to acute infective tubercular pleuritis. A consultant of skilled ability saw this patient some time later, put a needle low in the thorax on that side, diagnosed pleural effusion, and agreeing with the acute pleuritic infective view, advised aspiration. This patient, when seen by us, had all the signs of pneumohydrothorax. The physicians had gotten their needle into the hydro part of the resultant pathological accident and were misled. The operation of paracentesis thoracica was advised against by us and a bad prognosis was given the parents of the patient, both as to outcome and time, and our opinion proved correct.

The second patient, at the time of the pulmonary accident, was in a sanatorium, where she had been for eighteen months. The condition at its occurrence was diagnosed as acute cardiac failure, and she was expected to die at the time, which patients sometimes do at the onset of pneumohydrothorax. Her case was almost a replica of the one already reported, except that the physician in attendance insisted upon the heart insufficiency, and after a month sent her home, expecting a fatal termination from the cardia. She showed the classical signs of pneumohydrothorax, and the roentgen-ray plates not only confirmed our physical signs, but showed well how the patient literally was using only part of a lung, and that on the supposed normal side. Her cyanosis, which was extreme, was due to lack of lung space purely. The same prognosis, as to result and time, given in the former case was stated and was right.

It is possible that we are too greatly impressed by our recent experience, but we think not. The aforesaid consultant in the first case, skilled as he is particularly in pulmonary tuberculosis, would hardly have missed a common thing. Our own chest work makes us think that pneumohydrothorax is uncommon. On the other hand, it is possible that symptoms attributed to the cardia in late pulmonary tuberculosis belong here, as shown in one of our cases. This would mean that the condition, if common, usually goes unrecognized. One of my colleagues recently reported to me a case of this pathology following acute pneumonia, with death. It also occurs occasionally in early pulmonary tuberculosis. Our impressions are that pneumohydrothorax is rarer than formerly; that the prognosis is exceedingly bad; that like other complications of disease it is not recognized because not borne in mind and hence not looked for; and, finally, that little or nothing can be done for its correction or alleviation at present.

REVIEWS

SURGICAL APPLIED ANATOMY. By SIR FREDERICK TREVES, Consulting Surgeon to the London Hospital. Seventh edition, revised by ARTHUR KEITH, Hunterian Professor, Royal College of Surgeons of England, and W. COLIN MACKENZIE. Pp. 702; 153 figures, including 74 in colors. Philadelphia and New York: Lea & Febiger.

THIS compact little volume is so well known that no extended account of its scope and contents is necessary. As soon as the medical student has gained his first acquaintance with parts of the human body, such a book as this is very useful to him. In its method of presentation of anatomical facts it crosscuts the other methods. Like a beam of light from a searchlight it throws into prominent view certain structures in such a way that a vivid impression remains. In understanding these structures, one must know their relation and the adjoining parts as they are learned in an anatomical laboratory. But after all these are learned there comes the question of how much is to be retained, and there is no doubt that what is made use of in practice is the part that remains. An applied anatomy points out what these parts are, and is therefore helpful in directing the student's activities in a more or less definite direction. In the present edition the text has been revised to some extent with regard to the needs of war surgery. There has been added what the editors term "orthopedic anatomy," the kind of knowledge that is necessary for the successful treatment of stiffened joints and disabled limbs. Twenty-seven new illustrations have been added. These and other changes all tend to keep the book on the plane which it has long maintained. W. H. F. A.

MILITARY SURGERY OF THE EAR, NOSE AND THROAT. By HANNAU W. LOEB, M.D., MAJOR, M.R.C., U.S.A., St. Louis, Mo. Medical War Manual No. 8; Authorized by the Secretary of War and under the Supervision of the Surgeon-General. Philadelphia and New York: Lea & Febiger.

THIS manual has been especially prepared for the use of the nose, throat and ear specialists of the army and navy, and as the commis-

sioned otolaryngologists are presumably well grounded in the fundamentals, no attempt has been made to present elementary principles and practice.

Each chapter is divided into two portions. The first portion is an expression of the writer's opinion of the pathology, etiology, symptomatology, treatment, etc., of the various injuries and diseases of the ear, nose and throat. The second portion, under the heading "Comment," contains short abstracts, pertinent to the subject under discussion, garnered from the war literature published in England, America, France, Italy and Germany.

This little book really covers in a very creditable and comprehensive manner all of the special conditions which the otolaryngologist is liable to meet with in his military experience. The chapter on malingering will be found especially useful to the medical examiner. The chapter on ear and aviation is a reprint of an article published by Major I. H. Jones. The literature consulted by the writer of this manual has been very extensive, and chapter 17, consisting of thirty pages, is a very useful reference book of literature on this subject. Reconstruction and reëducation receive a commendable amount of attention. Although there are no illustrations, the text is sufficiently clear and comprehensive to enable the otolaryngologist to obtain a good working knowledge of the special war feature of diseases of the ear, nose and throat. G. B. W.

NEUROLOGICAL CLINICS: EXERCISES IN THE DIAGNOSIS OF DISEASES OF THE NERVOUS SYSTEM. Edited by JOSEPH COLLINS, M.D., New York. Pp. 271; 3 illustrations. New York: Paul B. Hoeber.

THIS is the first volume of case reports to be published by the staff of the Neurological Institute of New York. In it forty-one clinical cases or groups of cases, selected from those presented at the bi-weekly conferences of the staff, are discussed. These include a wide variety of neurological topics, such as cerebellopontine angle tumors, progressive hemiplegia, cerebral syphilis, gliosis of the spinal cord, hydromyelia and recent methods for recognition of the different types of hydrocephalus. A chapter is devoted to each topic and in each the essential points are brought out in a clear, straightforward manner, the average length of a chapter being five to seven pages. The method used is first to delineate the important symptoms, then discuss the interpretation of these symptoms and finally to arrive at a diagnosis. The manner in which this has been carried out should be very helpful not only to general practitioners, but also to those whose chief interest is in diseases of the nervous system. W. A.

A Text-book of Pathology. By Francis Delafield and T. Mitchell Prudden. Eleventh edition revised by Francis Carter Wood, M.D., Director of the Pathological Department, St. Luke's Hospital, New York; Director of Cancer Research, Columbia University, New York. Pp. 1243; 15 full-page plates and 809 illustrations in black and colors. New York: William Wood & Co., 1919.

This book, which has been known so long and favorably, appears in this edition as a considerably rejuvenated volume. The general arrangement remains the same as in former editions, thus assuring the physician and student of a reference work in which information is readily obtainable. This same fact assures the teacher of having in the hands of his students a book which can be consulted with little loss of time in searching for desired information. The scope of the book remains the same, including a chapter on pathological methods, brief, it is true, but containing the essentials of the subject.

The text of the book has been almost entirely rewritten and many new illustrations inserted. The chapters on tumors, urinary organs, reproductive organs of the female and bones and joints have undergone most complete revision, that on tumors showing the skilful and accurate exposition of the subject to be expected of the revising editor. Only favorable comment can be made on the revision of the text, but many old illustrations remain, and it is unfortunate that the illustrations could not have received the same extensive revision as the text.

The preface states that certain considerations of functional pathology have been admitted to the book, but indicates that a larger consideration of this phase of pathology finds its proper place in a text-book of medicine. There is room for argument in regard to this proposition, and the reviewer recognizes the limitations of space imposed by the practical necessity of publishing a book on pathology in one volume; but, nevertheless, the modern teaching of the subject involves so much instruction in alterations of function as associated with alterations in morphology that the more or less perfunctory discussions given in this book restrict its usefulness as a manual for students. The discussion of valvular lesions of the heart is particularly weak in this respect. Features of this sort are more or less compensated for by the excellent descriptions of the morbid anatomy and histology of various lesions, but even here deficiencies are noted, as, for example, in the description of syphilitic arteritis and also in tuberculosis of the lungs, where a beautiful illustration (Plate VIII) of peribronchial tuberculosis is called miliary tuberculosis.

A most valuable feature of the new edition is the list of references to important articles, monographs and books on subjects under discussion. These are carefully selected and the references accur-

ately given. There are only occasional deficiencies, which may represent deliberate omissions on the part of the editor. The reviewer, however, feels that the list of references to modern work on diabetes mellitus should include F. M. Allen's book.

The general impression created by the new edition is most favorable, and, considering the limitations placed by necessity on revision of an authoritative and standard book, the result is highly creditable. It is to be hoped that further revision will result in greater modernization, and there is no doubt that this will be true in the hands of the same editor. The book is mechanically excellent, and if the few criticisms recited above are reserved, the book can be very highly recommended to physicians, teachers and students as a valuable book for general purposes, and one which, by virtue of text, illustrations and references, presents the subject of pathology in clear, comprehensive and modern fashion. H. T. K.

THE OPERATIVE TREATMENT OF CHRONIC INTESTINAL STASIS. By SIR W. ARBUTHNOT LANE, BART., C.B., Consulting Surgeon to Guy's Hospital. Fourth edition, revised and enlarged. Pp. 328; 133 illustrations. London: Oxford University Press.

THE fourth edition of this monograph appears as a larger volume than any of its predecessors. There is practically no change in any of the material that has appeared in previous editions, but the present volume contains over 100 pages of entirely new matter representing contributions from nine other men who are in complete accord with the gospel as preached by Sir Arbuthnot Lane. These new contributors are men well known in their respective lines of work, and their opinions and writings are based upon the relationship of intestinal stasis to their special fields of investigation. In this manner the subject is considered from the viewpoint of the anatomist, pathologist, hematologist, ophthalmologist, clinician, bacteriologist, roentgenologist, gynecologist, and dentist, and it is a great tribute to Mr. Lane's work to note the unanimity of workers in such divergent specialties regarding the importance of intestinal stasis. Apparently the author has lost none of the enthusiasm that he exhibited in his earlier publications, and his associates are equally enthusiastic regarding his tenets; but such a statement as "All disease of what kind soever is due to intestinal stasis or cognate conditions," coming from the pen of Williams, must certainly be regarded as the opinion of an extremist and will not be taken seriously by the average reader. Aside from such a statement, however, Williams's contribution is one of the best of the new additions to the book, as it is very interesting, most entertaining

and at times logical. It is indeed fascinating to see how these authors can trace practically any morbid state to an underlying intestinal stasis, but in spite of the sincerity of their work it will be difficult to win the profession, of this country at least, to their belief. Typographical errors are more frequent than would be expected, but in other respects the book is quite attractive. F. B. B.

THE NEWER KNOWLEDGE OF NUTRITION. THE USE OF FOOD FOR THE PRESERVATION OF VITALITY AND HEALTH. By E. V. MCCOLLUM, School of Hygiene and Public Health, Johns Hopkins University. Pp. 199; 11 figures and 16 charts. New York: Macmillan Company.

THE author is one of those who have added to our knowledge of nutrition in the last decade. In this little volume he gives an interesting account of some of these advances in our knowledge, of how they have been arrived at and of how they are applied in our daily life. From this last point of view the book should appeal not only to the physician but also to the physician's wife. Most of the information in this book was presented recently as the Thomas Clarence Cutter lectures at the Harvard Medical School. These lectures have been edited and are now presented in a form which should have a wide circulation. The method of experimentation has been that of feeding to animals simplified diets of various purified foodstuffs, singly and in combination, in order to find out those substances which would promote growth and those inadequate to produce growth or even to sustain life. In this way two dietary essentials have been discovered. They are known as fat-soluble A and water-soluble B. The former exist in butter-fat, eggs and leaves of certain plants, and photographs of animals show the great difference which the addition of a small amount of one of these substances to an imperfect diet makes in the condition of the animal. The vegetable fats and oils, such as olive oil and cotton-seed oil, do not furnish this dietary essential. This method of seeing the results by feeding to the living animal is termed the "biological" analysis of foodstuffs in contradistinction to the method of studying nutrition values by chemical means. The one is needed evidently to supplement the other. The diseases due to faulty diets, such as beriberi, xerophthalmia, pellagra, scurvy, rickets are discussed at some length, and the author gives his views as to the dietary deficiencies or imperfections which are responsible for them. In the chapter on the planning of the diet, the various results arrived at are applied directly toward pointing out the direction in which our dietary habits should be trained, and great emphasis is put upon the inclusion of "protective foods," such as milk, eggs and leafy vegetables. W. A.

THE EARLY TREATMENT OF WAR WOUNDS. By COL. H. M. W. GRAY, C.B., C.M.G., M.B., F.R.C.S., Consultant in Special Military Surgery. Pp. 300; 25 illustrations. London: Henry Frowde and Hodder & Stoughton, 1919.

EMINENTLY qualified by long experience as consultant surgeon in France with the British Expeditionary Force, Col. Gray has written this book for surgeons preparing to undertake new problems under conditions that afford little opportunity for extensive reading. Most of the chapters, in a somewhat different form, have been published in the *New York Medical Journal*. The author describes the emergency treatment of wounded men in advanced areas, the measures that have reduced mortality due to transportation, and particularly the operative treatment necessarily carried out in the casualty clearing stations. Abdominal work is omitted from the chapters on regional surgery. The author emphasizes vital points in forceful style and keeps in mind the ideals to be sought. The illustrations are confined almost entirely to apparatus not well known in civil practice. Though not claiming too much for antiseptics in general, he advocates the use of some of the newer agents that did not attain popularity in the U. S. Army. The book also well illustrates the scope of work done by the sanitary trains and evacuation hospitals of the American Expeditionary Forces, and will prove of special interest to the thousands of physicians who did not realize their hopes for service at the Front.

G. M. L.

RADIODIAGNOSIS OF PLEUROPULMONARY AFFECTIONS. By F. BARJON. Translated by JAMES A. HONEIJ, M.D., Assistant Professor of Medicine in Charge of Radiography, Yale Medical School. Pp. 183; 27 drawings and 54 reproductions from roentgenograms. New York and New Haven: Yale University Press.

THIS book is a valuable contribution to collective roentgen literature on chest diagnosis and one which can be recommended to the roentgenologist for reference and study. The time has arrived when it is essential that the internist and the surgeon keep in touch with the advances that have been made in roentgen diagnosis of intrathoracic conditions, and this work offers an exceptional opportunity for demonstrating the possibilities of roentgen examinations and what should be expected from them. It is concise and dependable, though possibly not so systematic in arrangement as one would wish.

The first section describes the methods of examining by the fluoroscope and what information may be expected by this means. As with most continental writers, fluoroscopic studies have been

used to a greater extent and have been depended upon more than is the case with American roentgenologists.

The second section deals with the diagnosis of conditions of the pleura, and every phase of pathology of the pleura subject to roentgen study is carefully described in a very comprehensive manner, with the exception of neoplasms.

The third section includes various conditions of the bronchi and tracheobronchial lymph nodes.

The fourth section deals with pathological conditions of the lungs, including congestion, edema, pneumonia, abscess, gangrene, emphysema, fibrosis, atelectasis, tuberculosis, malignant growths and hydatid and dermoid cysts.

The final section refers to penetrating wounds by war projectiles, including a clinical and roentgenological study of the subject. Several methods of localization of foreign bodies are referred to and the indications for and contra-indications against removal are discussed. H. K. P.

A Manual of Physiology. By G. N. Stewart, M.A., M.D., Professor of Experimental Medicine in Western Reserve University, Clinical Physiologist to Lakeside Hospital, Cleveland. Pp.1245; with 1 colored plate and 492 other illustrations. New York: William Wood & Co.

In the preface to the eighth edition of this standard text the author notes the decrease of the output of research work due to the withering influence of the war. The plan of the book in general does not show many changes from the preceding edition. However, a number of additions have been made, especially in the portions dealing with the chemical phenomena of respiration, the function of the endocrine glands and metabolism. The modern theory of urine formation as recently formulated by Prof. Cushny is given some consideration. A new feature is the addition of references to original sources in the form of an appendix. This is a most useful bibliography, extending to 64 pages, and showing a careful selection of titles. Recent papers are usually cited in preference to older ones on the same subject. If proper use is made of this excellent list of papers by those in charge of student laboratories great advantages can accrue to the student. One method is to assign to each student a definite paper for short review, and at intervals during the session, to have the men read these before the class. In this way, the student is brought into direct contact with the results of original work, and he in turn distributes something of his information to his classmates. Many will find interesting the author's short discussion in the preface of the relation of laboratory work to text-book information. W. A.

ON THE NATURE OF THINGS. By HUGH WOODS, M.D., B.A., F.C.S. Pp. 248. New York: William Wood & Co.

FOR the general student of science, with a classical or metaphysical bent, this book will serve as a gently stimulating library companion. The author is evidently a great admirer and close student of Lucretius, and he here reasserts the doctrine of the poet of more than 2000 years ago and amplifies it with some of the results of modern scientific investigation. He finds that what Lucretius stated in his verse is still regarded as fundamentally true, and one can infer that the author, after the manner of the ancients, would enjoy a disputation with any one venturing to differ. W. A.

PHYSIOLOGY AND BIOCHEMISTRY IN MODERN MEDICINE. By J. J. R. MACLEOD, Professor of Physiology in the University of Toronto; Formerly Professor of Physiology in the Western Reserve University, Cleveland; Assisted by Roy G. Pearce and by others. Pp. 233; illustrations, including 11 plates in color. St. Louis: C. V. Mosby Company.

ONE of the aspects of research and teaching which is receiving attention by several groups of active scientific men at the present time is how to distribute the results of recent work, in any line, to those who ought to know about them and to use them in their professional work. Or, viewing the same situation from the standpoint of the individual, the question often arises, "How is one to keep up with the recent literature?" It is agreed that any scheme for making available the knowledge on scientific subjects at a given time must include three distinct types of publication: (1) current bibliographies in all the various lines of scientific work; (2) annual reports on the progress of studies; (3) systematic treatises and handbooks on all major subjects in research and practice. It is earnestly to be hoped that American organization and scholarship will enable this country to become independent along these lines. In the meantime, books of the type of the one under review are very important and fill a useful place in the distribution of knowledge. In this volume the authors review those portions of physiology and biochemistry which they believe to be of special value to the clinical investigator. They aim to present the current knowledge of human physiology, in so far as this can be used, in a general way, to advance the understanding of diseases. The applications of biochemical knowledge are considered in relation to some of the obscure problems of clinical medicine, such as those of diabetes, nephritis, acidosis, goitre and myxedema. Many topics that are ordinarily passed over cursorily in the text-book are treated quite at length. Such is the

case, for example, in the chapters relating to the chemistry of respiration, metabolism of carbohydrates and fats, problems of dietetics and growth, neutrality regulation in the animal body, and to the action of enzymes. Under these headings are brought together the results of recent work, and in each the attempt is made to show the experimental basis upon which many procedures in modern clinical medicine depend. Written with this point of view, the volume will serve as a most useful treatise for the physiologist and well-informed physician. W. A.

SURGICAL TREATMENT. By JAMES PETER WARBASSE, Surgeon to the Wyckoff Heights Hospital, Brooklyn, N. Y. Volume II. Pp. 827; 761 illustrations. Philadelphia and London: W. B. Saunders Company.

WARBASSE continues in this the excellent work of the first volume. To appreciate the scope of the volume one must keep in mind that it is confined to surgical treatment. To fill a work of this size by therapeutic considerations alone requires a fairly thorough sifting of the literature, and this has been accomplished, to a remarkable degree, without padding or repetition. Three hundred and twenty pages, or about two-fifths of the volume, are devoted to treatment of conditions of the head, a large portion of this section being confined to the specialties, including those of the eye, nose, pharynx, larynx, mouth and ear. One may fairly question the desirability of giving so much space to the treatment of conditions which the average surgeon of today practically never sees. Yet the text is so brief and interesting and the illustrations so numerous and so well adapted to the purpose for which they are employed that the average surgeon would probably prefer to have these specialties included. The general surgeon will probably gain a more serviceable knowledge of such conditions from a resumé made by a general surgeon after careful study of them. On the other hand, there is probably a wide variation in the extent to which different general surgeons will encroach upon the operations and surgical treatment usually reserved for the specialists.

Thirty-eight pages are devoted to the spine and thirty-six to the neck. Fractures of the spine are not considered here, and in the main only orthopedic phases of the spinal affections. Under the thorax we find an excellent resumé of the modern treatment of a few important surgical conditions, like empyema and abscess of the lung, including the tuberculous variety. The heart and esophagus receive special attention. An important feature in connection with abdominal surgery is the devotion of nearly forty pages to the detailed discussion of such interesting phases as preparation for operation, incisions through the abominal wall with excellent illus-

trations, control of gauze pads and instruments during the operation, prevention of adhesions and postoperative treatment. Twelve pages are given to observations on peritonitis in all its phases, including the tubercular variety, Of the abdominal organs only the gastro-intestinal tract, with the pancreas and spleen, are included. As stated in the beginning, this volume fully maintains the standard set in the first. T. T. T.

ESSENTIALS OF SURGERY. By ARCHIBALD LEETE MCDONALD, Formerly in Charge of the Department of Anatomy, University of North Dakota. Pp. 265; 46 illustrations. Philadelphia and London: J. B. Lippincott Company, 1919.

THE principles of surgery are discussed without direct reference to the nursing of surgical conditions, the purpose of the work being to give a nurse a reasonable conception of the surgical condition from which her patient is suffering. About forty pages are concerned with the various phases of infection. Tumors, wounds, hemorrhage, surgical operations and anesthesia are briefly covered, and then follow elementary resumés of the surgery of various tissues and organs of the body. Thirty-four pages are devoted to a glossary of important words associated with surgery. A knowledge of the contents of this book by a nurse must make for greater efficiency. T. T. T.

WAR SURGERY OF THE FACE. By JOHN B. ROBERTS, A.M., M.D., F.A.C.S., Professor of Surgery in the University of Pennsylvania Graduate School of Medicine. Pp. 442; 256 illustrations. New York: William Wood & Co., 1919.

THE publication of a treatise on plastic reconstruction after facial injury is timely in meeting the reawakened interest in the subject. This volume is by no means limited to war injuries, but contains a wealth of information on allied subjects applicable in the management of traumatic lesions of the head and face. The literature of recent experience is correlated with the sound principles of reparative surgery by an author of mature judgment, who writes with authority on civil practice, and with modesty while endorsing the opinions of those actively engaged in the treatment of wounded soldiers.

A section on the surgical anatomy of the face presents well selected illustrations from standard text-books. The major portion of the volume is divided about equally between sections on pathology and treatment of war wounds of the face and reconstructive treatment of war injuries of the face. The former includes associated lesions of the neck, the cranium and organs of special sense; surgical

shock, hemorrhage, anesthesia, radiographic diagnosis: the latter includes short chapters on shell-shock, traumatic neuroses and neurectomy of nerves of the face.

The illustrations, like the text, will in large measure apply to industrial injuries. It is to be hoped that a second edition will show some rearrangement of paragraphs for the sake of their value, and spelling less suggestive of haste in publication. G. M. L.

STEREOSCOPIC ATLAS OF PLASTIC SURGERY OF THE FACE, HEAD AND NECK, WITH CASE REPORTS. By JOSEPH C. BECK, M.D., F.A.C.S., and IRA FRANK, M.D., F.A.C.S. Pp. 132; 90 illustrations. St. Louis: C. V. Mosby Company, 1919.

THE authors present here a method of studying plastic surgery of the face, head and neck by means of stereoscopic illustrations and a small text volume which sets forth the principles of plastic surgery of these parts, together with case reports accompanied by many photographic illustrations. An attempt has been made to summarize the most frequent operations as given to the men of the Medical Reserve Corps. The stereoscopic illustrations are actual reproductions from the cadaver. For more detailed information the reader is referred to Loeb's *Operative Surgery* or an appended bibliography, which refers especially to the plastic work done since the war began. We are all familiar with the usual type of diagrammatic illustration used for this kind of surgery, and this newer method will be welcomed by all interested in this special field. The most important operations illustrated are palatoplasty, cheiloplasty, meloplasty and blepharoplasty. T. T. T.

PROGRESS
OF
MEDICAL SCIENCE

PEDIATRICS

UNDER THE CHARGE OF
THOMPSON S. WESCOTT, M.D., AND ALVIN E. SIEGEL, M.D.,
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Recovery of Normal Weight in the Various Organs of Albino Rats on Refeeding after Underfeeding from Birth for Various Periods.—JACKSON and STEWART (*Am. Jour. Dis. Children*, May, 1919, No. 5, vol. xvii), in a comprehensive research on white rats, have shown some interesting points that may be of great value when applied to the infant, insufficiently nourished and under the proper regime brought to a normal state of nutrition. The data in this series brought out first that albino rats underfed from birth to three, six, or ten weeks of age, showed rapid growth in body weight upon ample refeeding. Body weights of from 25 to 75 gm. were apparently reached more rapidly in those refed after underfeeding to ten weeks of age than in those refed after underfeeding for shorter periods. The body length remained slightly above normal in the group refed to 25 gm. body weight, but appeared nearly normal in the others. The tail length and the weight of the head, limbs and trunk appeared nearly normal in all of the refed groups. As to the body systems the integument appeared subnormal in weight in the group refed to 25 gm., usually normal (or above) in the others. The ligamentous skeleton appeared nearly normal in all of the refed groups, but the cartilaginous skeleton (moist or dry) tended to be subnormal in weight. The musculature was nearly normal in weight, with a slight apparent deficit in the later refeeding periods. The visceral group, as a whole, and the remainder of the tissues showed no constant or significant variations in the findings in the refed group. The individual organs differed greatly in the extent to which they had recovered their normal weight, as compared with that in controls of the same body weight, in the various groups refed to a body weight of 25, 50 or 75 gms. after underfeeding from birth to three, six or ten weeks of age. The weights of the various organs in the refed rats were as follows: The hypophysis and suprarenal glands were apparently nearly normal in weight in all groups: likewise the heart, lungs and kidneys, excepting an apparent overweight of doubtful significance in the groups refed after underfeeding to ten weeks of age. The liver was

rather irregular in weight, but probably within the range of normal variation. The brain, spinal cord and thymus appeared almost constantly subnormal in weight in all of the test groups. The apparent loss in the pineal body was of somewhat uncertain significance. The thyroid gland appeared subnormal on refeeding to 25 and 50 gm. after underfeeding for three weeks; otherwise normal. The ovaries were irregular in weight, apparently subnormal in those refed after underfeeding for ten weeks. The epididymides appeared subnormal on refeeding to body weight of 75 gm. The empty stomach and intestines were usually above normal weight in the refed groups; the canal with contents appeared more nearly normal in weight. The length of the intestines were somewhat above normal on refeeding to 25 gm. body weight and nearly normal later. There was little change in the relative length of the large and of the small intestines. The eyeballs showed a slight overweight of doubtful significance. Two organs showed an apparent tendency to overcompensation growth in the earlier stages of refeeding, with later retardation. The spleen was greatly above normal weight at body weight of 25 gm. or 50 gm.; but was normal or subnormal at body weight of 75 gm. The testes showed a similar reaction, the apparent atrophy in later stages of refeeding being especially marked.

Factors Affecting the Antiscorbutic Value of Foods.—HESS and UNGER (*Am. Jour. Dis. Children*, April, 1919, No. 4, vol. xvii) discuss some advanced ideas in regards to scurvy and its causes and prevention. Many reports show that during the late war there was considerable scurvy among the troops of the various armies; least of all along the western front. The scurvy was mainly of the latent or subacute type, and influenced the character of some of the infectious diseases, and may well have been a factor in the congelations occurring among the soldiers in the trenches. It is evident also that scurvy prevailed among the civilian population to a degree far greater than in peace times. In infants the question of scurvy centers about the milk supply. An infant requires fully one pint of fresh raw milk daily to protect it from the disorder. If the milk is pasteurized, or stale or heated for a second time or rendered more sensitive to deterioration by means of an alkali—and particularly if more than one of these influences are in operation—more than a pint is needed. The fact that there is an inverse relationship between the amount of milk consumed and the tendency to scurvy shows that we are dealing with not an exogenous toxin, but argues in favor of the disorder being primarily a deficiency disease. Milk does not necessarily lose its antiscorbutic value in the course of drying. If it is dried rapidly, even at a temperature of about 240° F., it retains sufficient of the protective factor to have curative value, provided, naturally, that it was fresh at the time of drying. In considering the question of the destruction of this "vitamin" by heat or alkali, the duration of exposure to the detrimental influence is of the greatest importance. Babies fed on pasteurized milk should receive an antiscorbutic from the time that they are a few weeks of age, as there is no reason for allowing the negative balance of "vitamin" to continue for a longer period. A small amount of orange juice will answer the purpose, and is potent for a period after alkalinization. Its value does not

reside in its laxative properties, nor in its salt content, as artificial orange juice has practically no therapeutic effect. If orange juice is filtered, boiled and rendered faintly alkaline, it may be given intravenously without causing any slightly untoward reaction. In this way a very prompt cure can be accomplished. From a pathogenic viewpoint, a result obtained by this route is of interest as demonstrating that scurvy can be counteracted by a therapy acting quite apart from the alimentary tract. Diuresis and catharsis do not play an important role in the cure of scurvy, as they may be stimulated to a high degree without alleviating the symptoms. This fact argues against regarding this disorder as essentially toxic in nature. It was found also that giving an antiseptic such as sodium benzoate was without effect. Dehydrated vegetables were without effect in two instances in which an equivalent amount of fresh vegetables brought about a cure. It is not to be inferred from this that dehydration necessarily destroys this "vitamin." In this connection too much attention has been paid to the degree of the heating process, and too little to the more important factors—the age of the vegetables, their freshness previous to dehydration, and their manner of preservation. For about a year strained canned tomatoes have been given in the place of orange juice to a large number of infants. This substitute has been found to be a very effective antiscorbutic, and is well borne by babies even only a few weeks of age. It has the advantage of low cost and availability, and therefore is of particular value for the infants of the poor.

Autoserum Treatment of Chorea.—Brown, Smith and Phillips (*British Jour. Children's Dis.*, January-March, 1919, Nos. 181–183, vol. xvi) describe a recent addition to the therapy of chorea, for which they claim more definite and marked results than have followed the former methods used. In practically every instance in their series there had been previous medical treatment given with the usual indifferent and usually fading results. In most cases there was a mild reaction in the form of vomiting and an occasional rise in temperature, and on only one occasion was the reaction of such a nature as to prevent the return of the patient to the clinic owing to parental objection. The withdrawal of an equal amount of fluid as of serum injected did not appear to be necessary. It occurred to the authors that failure to obtain satisfactory results and prompt reaction might be due to the lack of sufficient antibody production in the plasma. This seems quite within the limits of possibility, taking into consideration the individual varying susceptibility to disease. It is most essential that both tuberculosis and syphilis be excluded, and that all drug therapy be suspended for at least five days previous to the injection. Most serious results have been encountered when this latter point has not been observed. Drugs circulating in the blood-plasma have a much more potent effect when injected into the canal, and serious results are thus obtained, particularly after the use of the salicylates, when the very toxic symptoms of salicylic acid poisoning have presented themselves. In practically every instance the treatment was administered in the Out-Patient Department, the patients returning home within an hour or two following the injection. The first step is withdrawing about 50 c.c. of blood from the median basilic vein. In some instances an anesthetic

is necessary, as the patient is often too nervous to keep still sufficiently long to obtain the amount of blood required. Ethyl chloride was the anesthetic used. It is important to have the tourniquet applied just tight enough to impede the arterial flow; the arm is soon emptied of the venous blood, and no more can be obtained until the tourniquet is released. A good plan in this connection is to use a blood-pressure band on the arm, and to have it inflated to about two-thirds of the blood-pressure. The blood is received into three sterile test-tubes, the rubber tubing and the needle having been previously sterilized and held, so that the opening in the test-tube is protected from contamination by a piece of sterile gauze wrapped about the rubber tubing down to its point of entrance into the test-tube, the gauze from there on being held about the test-tube. The tubes are stoppered with sterile plugs, and set aside for a few minutes to allow the blood to clot. Before putting into the centrifuge a sterile platinum loop is run down inside each tube to separate the clot from the test-tube in order to obtain the greatest amount of serum possible. The test-tubes are then put into the centrifuge for thirty to forty minutes. At the end of that time the serum is drawn up into a sterile pipette, emptied into a sterile test-tube, and put in the incubator to keep it at the proper temperature for injection. In the first 4 cases of this series the serum was injected after having been inactivated. Later this was omitted, and absolute trust was placed in the technic to keep the serum sterile. From 50 c.c. of blood 20 to 25 c.c. of serum is obtained. The preparation of the serum takes from one to one and a half hours. The patients were received about nine o'clock in the morning and the serum was ready at eleven. The patient is prepared for lumbar puncture. An anesthetic is always used, and he has no breakfast. The serum is drawn into a 20 c.c. Record syringe, which fits the ordinary lumbar puncture needle. Then the patient is anesthetized with ethyl chloride, the needle inserted, and about 20 to 25 c.c. of spinal fluid withdrawn. The Record syringe is then attached, and the serum slowly injected. This is the crucial step in the operation, as it is essential to give as much serum as possible without causing pressure symptoms. As one slowly injects the serum, when sufficient has been injected, one feels definite obstruction to the entrance of serum. Further injection after this resistance to injection has been encountered, invariably results in marked pressure symptoms, such as vomiting, severe headache, elevation of temperature. An anesthetic is necessary to enable one to detect this sense of resistance. In this series of cases there was used on an average 17 c.c. of serum. The patients were kept in the hospital for one to two hours to watch for pressure or heart symptoms. They were then sent home to bed for one week, when they returned to the hospital. In the meantime they were visited by the public health nurses to see that instructions were carried out. Usually improvement followed in two or three days, and became stationary again by the end of the week, when they returned to the hospital and another treatment was given. Following the injection there may be mild disturbance, such as a slight rise of temperature, slight stiffness of the neck, or increased pulse-rate. These rapidly pass off. Nothing solid is given to eat six to eight hours following the treatment. This method of treatment was productive of infinitely more satisfactory results than any other form of therapy. A cure

of 77 per cent. of the cases was effected within three weeks' time. The technic is so simple that it may be employed in any home or out-patient department under mild anesthesia. With the observance of the proper precautions the reactions are negligible. There were no recurrences in over a period of a year and a half, but more time is necessary in order to give a more definite decision on this point. In view of the fact that chorea is generally recognized as a bacterial disease due to a streptococcus of the viridans group, certain antibodies must be in the circulating blood-plasma, which antibodies do not enter the cerebrospinal fluid on account of the choroid plexus, which does not permit the transmission of these antibodies into the spinal canal. When the serum is injected into the canal a certain chemotactic action takes place, and the walls of the choroid plexus become permeable.

Syphilis and its Relation to Infant Mortality.—JEANS (*Am. Jour. Syphilis*, January, 1919, No. 1, vol. iii). Death in a syphilitic infant may result from the infection alone, from a progressive malnutrition, or because of a lowered resistance and accidental intercurrent disease. Often all three factors are concerned, because an infant dies of pneumonia does not mean that syphilis played no part in the outcome. Most of the deaths occur under ten months of age, and the mortality is appreciably lowered after seven months. The statistics show that from 10 to 20 per cent. of adult males and about 10 per cent. of married females are syphilitic, and a minimum of 10 per cent. of marriages involve syphilitic individuals, 75 per cent. of all of the offspring in a syphilitic family are infected. In a syphilitic family 30 per cent. of the pregnancies terminate in death at or before term, a waste three times greater than is found in non-syphilitic families, 30 per cent. of all the living births in a syphilitic family die in infancy as compared to a normal rate of 15 per cent. in the same class. Probably 25 to 30 per cent. of clinically syphilitic infants die as a result of syphilis, 17 per cent. of all the pregnancies in syphilitic families result in living non-syphilitic children, who survive the period of infancy. Over 5 per cent. of our infant population is syphilitic.

The Maloney Method of Reëducation in the Treatment of Chorea.—GROSSMAN (*New York Med. Jour.*, May, 1919, No. 20, vol. cix) says that during the acute febrile period, little in the way of reëducation is possible. Active exercise in this period may be harmful. He found the rest or relaxation exercises, described by Dr. W. J. M. A. Maloney, of value in quieting the patient during this period. The diaphragmatic breathing is of great aid in inducing relaxation of the muscles. The patient is asked to take a deep breath using his diaphragm, restricting his thoracic movements, and at the height of inspiration to pause, then slowly and evenly to breathe out and again to pause. This breathing soon tires the patient if continued too long, so after ten or twelve of these deep respirations have been taken, the depth of inspiration and the pause are shortened until the patient is breathing without effort as in sleep. To relax the muscles, passive movements, in which the muscles are alternately lengthened and shortened, are employed. The muscles of the forehead, cheek and jaw are thus manipulated until wrinkling of the forehead and blinking of the eyelids disappear and the

muscular spasm is eliminated. Next a shoulder is relaxed, then an arm; each in turn must passively move until all traces of muscular tension vanish, and the part lies motionless and flaccid, and falls limply from any unsupported position. Then the leg on the same side should be taken next. After a part is relaxed, those parts previously treated should be briefly dealt with again, in the order in which they were first relaxed. This linking of parts previously relaxed with parts newly relaxed is helpful in bringing the entire body into a state of relaxation. During the passive movements the operator should continually direct the attention of the patient to the control of the choreic twitchings; gradually this requires less and less effort, and soon complete and perfect relaxation is possible. After the temperature and the pulse-rate have reached normal and remained so for several days, and the child has mastered the rest exercises well enough to allow the limbs to be freely moved passively in all directions without exciting either rigidity or spasm, active movements may be begun. At first simple movements, flexion, extension, adduction, and abduction at the joints should be used. These movements should be guided along the normal planes; rhythm, rate and force should be regulated by counting or by using a metronome. Next the patient resists the movement in order that the ability to maintain tonic contraction may be increased; finally the movement is done against the resistance of the operator. This tends to overcome the loss of power in the muscles due to lack of control. When the patient is able, in the recumbent position, to perform all movements in proper time and rate to the normal extent and with the normal force, reëducation to maintain the normal attitude may be begun. Creeping on the hands and knees is first taught; next balancing and creeping on the knees are attempted; finally maintaining the erect attitude and progression are taught. The changes should be made gradually, and the patient must avoid all fatigue. By alternating the rest exercise with active work, several hours a day can be used for reëducation. Precision of movement can be regained by the use of toys, which at the same time will interest and amuse the patient. Building blocks, fishing games, jig-saw puzzles for the younger and for the older children, dominoes, pegs to be fitted in the holes of a backgammon board, and innumerable other toys used in kindergartens may be employed. The aim of the exercises is to encourage freedom, as well as precision of movement; and any incoördination present is corrected, if continued for a sufficient length of time. It promotes continued concentration with increased mental stability.

A Study of Fat Metabolism of Infants and Young Children.—Holt, Courtney, and Fales (*Am. Jour. Dis. Children*, April, 1919, No. 4, vol. xvii) report the following results of their studies on the stools of normal breast-fed infants: "The fat of the stools of normal breast-fed infants, according to our observations averaged 34.5 per cent. of the dried weight and frequently was as high as 50 per cent. The soap fat in the best stools predominated over the other forms of fat, averaging 57.8 per cent. of the total fat, as determined on the dried stool. The average stool of the normal breast-fed infants showed a soap fat of 43.1 per cent. of the total fat, as determined in the dried stool, which would correspond to over one-third of the total fat of the fresh stool. The

neutral fat in the best stools averaged 15.9 per cent. of the total fat; in the average stool the neutral fat was 20.2 per cent. of the total fat. The amount of neutral fat is not affected by the drying process. No constant relation was shown between the percentage of fat in the mother's milk and the percentage of total fat and its distribution in the stool. With a higher total intake of fat, the fat percentage and the soap fat in the stool were somewhat increased. A range of fat absorption from 90.3, 99.2 per cent. of the intake was found in healthy breast-fed infants."

OBSTETRICS

UNDER THE CHARGE OF

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Labor in Old Primiparæ.—KAUWER (*Jour. arch. mens. de obst. et de gynec.*, 1917, vi, 207) has made a personal study of labor in primiparæ above the average age in 5300 labors in the clinic at Utrecht. He finds that as the age of the patient increases so does the duration of labor, and the cause of this phenomena is the diminution in the contraction of the uterus. The number of forceps applications increases in the same proportion. The influence of age begins after the twenty-fourth year and is probably the consequence of functional weakening of all the organs of the body. This includes the ductless glands acting on the uterus causing modifications during pregnancy. His statistics showed that at twenty years of age the average duration of the first labor is fifteen hours. At twenty-four years of age, sixteen hours; thirty to thirty-seven years, thirty-eight hours, with a steady increase from the twenty-fourth year. Requiring extraction by forceps at the age of twenty, 5.4 per cent.; twenty-four years, 7.5 per cent.; thirty to thirty-seven years, 21.3 per cent.; thirty-eight to forty-seven years, 34.3 per cent. Eclampsia increases from 0.86 and 0.88 per cent. at twenty and twenty-four years to 3.33 per cent. between the ages of thirty-eight and forty-seven. Albuminuria increases from 12.3 to 21.5 per cent. at twenty and twenty-four years to 34.2 per cent. at thirty-eight and forty-seven years.

Post Partum Eclampsia.—HAUGH (*Jour. arch. mens. de obst. et de gynec.*, 1917, vi, 224) observed 140 cases of eclampsia among 8600 deliveries in the hospital of Copenhagen. Of these only 19 were post partum, 13.6 per cent. It was evident that age influenced the disease near the time of the onset of labor. The most important factor seemed to be a well marked and free secretion of urine, which marks the beginning of recovery. So far as treatment is concerned that which produces elimination is best of all. Lavage of the stomach and intestine, with the administration of purgatives is indicated. Venesection for eclampsia was practised under Maricean in 1670. In 7 cases in which the writer

removed from 600 to 1000 c.c. of blood, convulsions ceased at once. Other cases so treated did not show such rapid improvement. The majority of observers have found that post partum eclampsia is much less fatal than that which occurs before labor. All of the writer's cases recovered.

Can the Frequency of Some Obstetric Operations be Diminished?—VOORHEES (*Am. Jour. Obst.*, January, 1918) draws attention to the increase in the performance of many obstetric operations. The high forceps operation and elective version, symphysiotomy and pubiotomy are more or less obsolete. Craniotomy is performed as a last resort on a badly injured or non-viable fetus. On the other hand, induction of labor and Cesarean section are very frequently used as a method of overcoming obstetric difficulties.

Voorhees believes that physicians should study their pregnant patients carefully and that if this precaution were taken that eclampsia would greatly diminish. He cites the statistics of the Sloan Maternity in which eclampsia has diminished in frequency from 1.5 per cent. to 0.8 per cent. This has been accomplished by prenatal observation and care. Manipulation of labor may often change an unfavorable to a favorable presentation. Thus a breech presentation may be converted into a vertex and a brow or face converted into a vertex. In cases where the child shows a tendency to be unusually large much can be done to limit the growth of the infant by restricting the woman's diet. After the sixth month the amount of carbohydrates in the woman's food should be cut down. Two cases are cited in one of which diet was successful and in the other diet accompanied by the induction of labor. The writer believes that long walks during pregnancy tend to make labor easy and comparatively successful. A properly fitting, snugly applied corset worn during pregnancy also tends to bring the head of the child into the brim of the pelvis and to cause moulding sometime before labor begins. When the uterus is allowed to prolapse through the abdominal wall or carrying the abdominal wall with it, abnormal presentations may develop a difficulty in labor. Under some circumstances a decision to perform Cesarean section is easily made and is the only right and logically effective method possible. Pituitrin has an admitted field and patients should be strictly guarded lest the drug be used improperly. While twilight sleep has proved of little or no value attention has been called to anesthesia and the use of nitrous oxide and oxygen and greater care and skill in the employment of ether are distinct gains. Recognizing the desirability of having a first child born a little before full term, labor can often be brought on by the use of quinin and castor oil. The use of the dilating bag is also advisable and the writer states that in 24 cases in the year's practice he has induced thus labor without fetal or maternal mortality. The writer describes a borderline case in which labor was brought on before term by oil and quinin, followed by the insertion of a bag. It was thought that the child was not especially large. The patient became exhausted, although nitrous oxide and oxygen were used to relieve her pain and the choice lay between Cesarean section and high forceps. The latter was selected with the result of the death of the fetus and convulsions ten

hours after labor. No autopsy could be obtained. In another case where the patient had repeatedly lost children by intra-uterine death just before term Cesarean section was performed elective about three weeks before term. An excellent result for mother and child followed. The argument of the writer is that while on the one hand some obstetric operations have been rightly discarded; on the other there is a tendency to resort to Cesarean section in all difficulties of labor when other and less radical procedures might prove successful.

Labor Complicated by Placenta Previa.—ROSSIER (*Rev. méd. de la Suisse romande*, June, 1918) in placenta previa tampons the vagina only when there is not sufficient dilatation of the cervix to admit two fingers. The utmost antiseptic precautions are taken, a speculum having been sterilized before introduction and sterilized iodoform gauze being used from an air-tight container. He believes that with these precautions tamponing is free from objections. If two fingers can be freely passed through the cervix the tampon is contra-indicated and preparations should at once be made for an abdominal operation. The great fault of the Braxton-Hicks method of version is the fact that it condemns the child to almost certain loss and hence if the fetus be viable this method of version should be used only in cases where Cesarean section cannot be done.

The Termination of Pregnancy in Eclampsia.—ROSSIER (*Rev. méd. de la Suisse romande*, June, 1918) strongly urges that in the event of eclampsia occurring the woman should be delivered as promptly as possible by Cesarean section. He describes the case of a patient in whom a convulsion lasted for thirteen minutes, followed by twenty minutes of coma. The blood-pressure was 180, but dropped to 150 after bleeding, and the urine contained 32 per 100 parts albumin. The patient became better, but upon the fourth day blood-pressure had risen to 195 and there were 7 parts per 1000 albumin in the urine, which was very scanty. On the day following the blood-pressure was 210 and the cervix could be entered by one finger only. Cesarean section was performed so soon as possible and mother and child did well. The mother's blood-pressure fell rapidly and there were no further convulsions. The writer has carried out this method of treatment in 19 cases, with a mortality of 21.1 per cent. These results are better than those which he obtained by other methods of treatment.

Incision of the Perineum in Primipara.—POMEROY (*Am. Jour. Obst.*, August, 1918), in a paper read before the American Gynecological Society, raises the question as to whether in primipara it would not be better to make a central incision in the perineum, thus shortening labor and preventing severe laceration. As regards the danger of injury to the sphincter of the bowel, the writer believes that this is avoided by thoroughly stretching and paralyzing this muscle before making the incision. He states that a relaxed sphincter cut in the midline is as accessible and manageable for repair suture as though the perineal body were homogeneous. This procedure is of great value in preventing

risk to the newborn child. Many have perished from birth pressure in a long first labor. This procedure is carried out as follows: Nitrous oxide gas anesthesia is employed, the sphincter of the bowel is dilated with a sterile gloved hand, using tincture of green soap as a lubricant. Labor is allowed to proceed under analgesia until the tissues in the posterior wall of the vagina begin to separate and there is very slight hemorrhage. This foretells inevitable laceration and the patient is completely anesthetized and when the head is not pressing strongly down immediate incision is made with scissors an inch or more up to the posterior column of the vagina and externally nearly to the rectal mucous membrane. All tissues are severed to the rectal wall, except the sphincter of the bowel and by short cuts rather than a long and swift incision. A gloved finger in the rectum is used as a guide. The head is then delivered very gradually with the patient still under anesthesia, either by pressure upon the fundus by an assistant, or with the use of very short forceps, the patient is absolutely asleep and unable to exercise the slightest force. It is sometimes well to insert above the anal margin a stitch to serve as a guard against the extension of the laceration. Where there is no doubt that room enough will not be obtained by median incision to permit the safe exit of the head the sphincter is also incised. Whether this be an entire separation or only a partial one if the sphincter has been relaxed upon stretching there is practically no risk of failure in union. Even should considerable pressure be made upon the rectal tissues no essential and immediate damage will be done. This is illustrated by the fact that prolapse of the uterus is rare in association with lacerations of the perineum to the third degree. Where forceps is used or the child is delivered by breech extraction, the main portion of the levator fascia can be stretched easily through the rectum while the hand is dilating the sphincter. In repairing the tissues chromic catgut No. 1 should be used for all sutures exposed on the skin or mucous membrane or for buried sutures in the sphincter. Plain catgut No. 2 is indicated for all deeply buried interrupted sutures except those in the sphincter. In closing the incision in the median column care should be taken to bring together the edges of the muscular tissue and not merely to close the mucous membrane. So throughout the length of the incision muscular tissues should be brought together. Several supporting stitches of silkworm gut may be used. If the operator desires a continuous buried suture and a subcuticular stitch may be employed. The writer believes that the primiparous woman should always be treated in the hospital and by an expert. While in subsequent labors she may, if desired, remain at home under the care of a conscientious general practitioner. The question arises will a patient so treated have lacerations in subsequent labors? With a view to preventing subsequent laceration the writer has in thirty cases adjusted his operation in such a manner as to secure good union of all the important muscles primarily, thus leaving space for the delivery of children without tearing into the muscular tissue.

The Chemical Constitution of the Placenta.—Some of the most serious complications affecting labor occurred during abnormal conditions in the placenta, and hence the composition of this important organ becomes a matter of very considerable importance. Chemical

analysis of tissue has not always given satisfactory results if in some cases the tissues contain fluid whose composition greatly alters the value of the chemical examination. DRUMMOND (*Biochem. Jour.*, 1916, No. 10). After examining various organs in the body to determine the nitrogen contents and also the placenta found a surprising similarity in the distribution of nitrogen in the tissues of the breast, liver, pancreas, spleen, kidney, and in plain and striped muscle, and this fact gives no basis for speculation regarding the various functions of these tissues. In HARDING and FORT's analysis (*Jour. Biolog. Chem*,. 1918, No. 35) of human placenta they found a large quantity of diamino-acid, argynin and protein, which is not found except in the placenta in so great a quantity. While other human organs contain this the placenta has at least twice the usual amount. By some chemists this substance is supposed to have a part in the formation of creatin and creatinin. It also has to do with the purin compounds, with the material which forms new nuclei. While no definite conclusion can be reached from these investigations, they point to the fact that the placenta from the chemical standpoint cannot be considered as an entirely passive organ and that it has a function which is distinctly different from that of other organs in the human body.

GYNECOLOGY

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Technic for Releasing Pelvic Adhesions.—There is perhaps nothing more tedious in gynecologic surgery than the proper release of adhesions between the pelvic organs, especially the sigmoid and bladder with the uterus or tubes, as is so commonly seen in pelvic inflammatory disease of gonococcal origin. The separation of the organs is quite easily accomplished in acute cases, but we seldom operate upon the acute cases, so that by the time the surgeon encounters these adhesions they are firm and dangerous to deal with. Each surgeon must solve these problems for himself as the occasions arise but it is always helpful to know what other surgeons are in the habit of doing in similar cases, therefore the methods employed by GRAD (*Am. Jour. Obst.*, 1919, lxxix, 344) in these cases will be of interest. In cases where two hollow organs are adherent, the cleavage method must be followed as one is working between two walls of important viscera. The organs torn, either the bowel or the bladder, must be repaired by suturing the rent since observation has shown that both the sigmoid and the urinary bladder tolerate injury very well and by repairing these rents the suture line will hold in a very large number of cases. Under all other conditions, however, whenever one is dealing with diseased tubes or ovaries

adherent to sigmoid, rectum or loops of small intestine, it is to be borne in mind that separating these adherent bowel structures not along their line of cleavage, but cutting them away at the expense of the parts to which they are adherent, is always preferable according to the experience of Grad. By adopting this technic, the surgeon will have less bowel injuries to deal with, which is a very important point of consideration. Not only in pelvic surgery, but in the repair of postoperative hernias the same principle holds good and there need not be any apprehension about leaving pieces of tissue on the bowel wall as they do no harm. In cases of tubo-ovarian abscesses when the sigmoid or rectum is involved, cases with thick massive infiltration of the mesosigmoid, and where the abscess cavity is draining into the bowel, the same technic can be adopted. By utilizing the adherent tissue on the wall of the sigmoid or rectum as the case may be, the rent in the bowel can be closed more readily. It is true that in a very large number of cases, where the sigmoid has been adherent to diseased adnexa, and the outer coat has been torn during liberation, no suturing is required and no harm will result. The cases get along very well as long as the mucous coat of the bowel is not injured and no bad results will follow, nevertheless it is far better not to injure the outer coat. When the lumen of the bowel has been entered, the complication is a serious one and every attempt should be made to repair the mucous surface as accurately as possible. In repairing the mucous coat of the sigmoid or upper rectum, the inaccessibility of these parts calls for thorough exposure and skilfulness in the placing of sutures; however, with proper repair of the mucous and submucous coats, the healing power of these parts is phenomenal. Having repaired these injuries, the suture line should be allowed to fall against some surface to which it may become adherent, either the posterior surface of the uterus, the cul-de-sac itself or the bowel wall. No drainage material should be placed against the suture line, and certainly no gauze drain should be placed on it. If drainage is called for, it should be placed above the line or to the side of it and it should be remembered that rubber dam is preferable to gauze in these cases.

Postoperative Cystitis.—The frequent occurrence of cystitis after pelvic operations, especially after extensive plastic operations involving the anterior vaginal wall, makes the subject of great importance. From the observation of a considerable number of cases, WATKINS (*Surg. Clinics of Chicago*, February, 1919, p. 213) is firmly convinced that the so-called postoperative catheter cystitis does not usually result from infection from the catheter, but from the presence of an increased amount of residual urine. As an illustration of this contention, he mentions the case of a woman aged forty-five years, who consulted him for uterine prolapse, a large cystocele and lacerated perineum. The uterus was about twice normal size. She had the usual symptoms of prolapse and also had some vesical irritability. Examination of the urine showed cystitis and the use of the catheter immediately after urination showed on an average of $1\frac{1}{2}$ to 2 ounces of residual urine. The lesions were corrected by a modified transposition operation including a high amputation of the uterus and suture of the resulting stump to the fascia underneath the trigone of the bladder. This operation resulted in considerable traumatism to the bladder, which was

already infected and which had defective muscles as the result of having been overstretched and displaced. Following operation she had a partial bladder paralysis which is common and should be expected in such a case and although she was able to pass some urine, it was nearly two weeks before the residual urine became normal in amount. For several years Watkins has given careful attention to the question of increased residual urine, with the result that postoperative symptoms and findings are almost invariably proportionate to the amount of residual urine which the patient carriers. The fact that bacteria are often eliminated through the kidney means that bacteria very frequently travel through the bladder cavity, and in the case of the presence of a considerable amount of residual urine, infection is very liable to result. Therefore it has become his custom to test for residual urine as soon as symptoms referable to the bladder develop, and to catheterize at least once daily until the amount of residual urine becomes normal, which is ½ to 1 dram. Instillations of silver are used after catheterization, commencing with a weak solution of ¼ of 1 per cent. and gradually increasing the strength should progress be unfavorable. Benzoic acid in doses of 5 grains four or five times daily is given in case the urine is neutral and as soon as the urine becomes acid, urotropin is ordered, commencing with 5 grains three times a day and increasing the amount 5 grains each day until formalin appears in the urine. Then the amount is again diminished until a weak reaction of formalin is obtainable. If the urotropin causes an acute irritation, it is stopped at once and large doses of sodium citrate are given until relief is obtained. The result of this treatment has been that the patients when finally discharged are cured of the cystitis, although in occasional cases it is necessary to continue some bladder treatment after the patient has left the hospital.

Tuberculosis of the Uterus.—Tuberculosis of the uterine mucosa occurs much more commonly than one would suspect from a perusal of current medical literature, according to Scott (*California State Jour. Med.*, 1919, xvii, 52). It occurs at all age periods, but is most common in the decade between the ages of twenty and twenty-nine years. The symptoms are disturbances of menstruation, especially metrorrhagia and dysmenorrhea, feeling of weight in the pelvis, progressive constipation, painful defecation and pain radiating from the hypogastrium to the lumbar region, to the upper thorax and along the perineum. The differential diagnosis must be made between carcinoma, chronic endometritis and syphilis of the uterus. The primary form of the disease is comparatively rare, most cases being secondary to disease elsewhere in the body, but it occurs in four main types, namely, ulcerative, miliary, interstitial and peritoneal and of these types, the ulcerative is the most frequently found. The prognosis is extremely unfavorable in all except the rare primary cases. The treatment in the secondary cases must be symptomatic and supportive, but in the primary cases, curettage of the uterus will result in a cure, if the disease has not invaded the Fallopian tubes. If the tubes are involved, hysterectomy must be the operation of choice. Operative procedures on the uterus, when the seat of secondary tuberculosis, are harmful and are positively contra-indicated.

Non-surgical Removal of Ureteral Stones.—There has been much written of late years concerning the removal of ureteral stones by non-operative methods and many different technics have been advocated. In a series of 23 cases which were treated by MERRITT (*Southern Med. Jour.*, 1919, xii, 143) the stone was passed in 21 cases after the use of the following procedure. The cystoscope is introduced and the ureter below the stone is dilated with ureteral dilators. After the introduction of 2 to 4 c.c. of a 2 per cent. solution of papaverin or novocain through a ureteral catheter, the catheter is withdrawn so that the ureteral walls may be infiltrated thoroughly. If a small ureteral orifice obstructs, then use ureteral scissors to cut the meatus to the desired size. After this, pass a stiff catheter to or beyond the stone and inject from 2 to 4 c.c. of sterile olive oil. This is followed by the injection of a few drops of a 10 per cent. argyrol solution for its antiseptic value, and it also possibly reduces the soreness from manipulation. The patient, if not in pain, may sit up, but if in pain, large doses of morphin, hot applications and an abundant intake of fluids are indicated. This procedure is employed at intervals of three days if the condition of the patient will permit, the average number of treatments required being three.

Effect of X-rays on Carcinoma in Vitro.—Some experimental work with mouse tumors has been performed by KIMURA (*Jour. Cancer Research*, 1919, iv, 95) to determine the effects of roentgen-ray irradiation on living carcinoma and sarcoma cells in tissue cultures *in vitro*. In the course of the research, it was found that mouse carcinoma and sarcoma grow as well in guinea-pig plasma to which has been added mouse serum diluted with Ringer's solution as in mouse plasma itself, and the outspreading growth of cells in culture, both sarcoma and carcinoma, was not stopped by roentgen-ray action varying from E 4 to E 12. The mitotic figures of cells were limited to a minimum after an exposure of E 8; after exposure to E 12, however, they disappeared entirely and the treated tissue produced no tumor when inoculated into mice. The growing power of sarcoma after E 4 exposure was stimulated to some extent, while carcinoma was not appreciably influenced. After an exposure of tissues to E 12, both sarcoma and carcinoma, the growing power of these tissues was stopped when inoculated into mice, and eliminated the process of mitotic division of cells. The process of oxidation of tissues, both sarcoma and carcinoma, was stimulated by the roentgen-ray action of E 4 and retarded by exposure to E 12 of the ray. The terms E 4, E 8, E 12 indicate that the Hampson's pastille used showed No. 8 or No. 12 tint, that is, equivalent to a dose $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ of Sabouraud's B tint.

Primary Chorionepithelioma of the Ovary.—Primary chorionepithelioma of the ovary is rare, indeed some authorities consider the ovary to be by far the most unusual site for the extra-uterine development of this form of malignant tumor, so that a case of this kind, which has been reported by KYNOCH (*Edinburgh Med. Jour.*, 1919, xxii, 226) may be of passing interest. The history of the case is that of a nullipara, aged twenty-four years, who complained chiefly of severe pain in the left iliac region, with irregular vaginal hemorrhagic discharge of six weeks' duration. The menstrual history was negative until fourteen

weeks before the patient was admitted to the hospital, when there was eight weeks amenorrhea, followed by the hemorrhagic discharge just mentioned. On examination, the uterus was found slightly enlarged, and in the left fornix there was felt a round tender swelling about the size of a hen's egg, corresponding in position to the left ovary. Laparotomy was performed and the left ovary was found enlarged, nodular on the surface and of a dark purple appearance. It was of such soft consistence that it ruptured and bled freely during the manipulation necessary for its removal, bringing to mind the possibility of an ovarian pregnancy. The convalescence was uneventful, the patient leaving the hospital three weeks after operation, but one month later she was readmitted complaining of a swelling at the seat of the abdominal incision, which was about the size of a billiard ball, firm and tender and which was regarded as a hematoma. It increased rapidly in size, however, and an incision was made into it and it was found to consist of a liver-like substance. Examination per rectum now revealed a soft doughy tumor bulging into the lumen of the bowel. The patient became progressively weaker and died three weeks later. At autopsy, the pelvis was found filled with recurrent chorionepithelioma and metastases were found in the lungs and liver.

PATHOLOGY AND BACTERIOLOGY

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Results of Prophylactic Vaccination against Pneumonia.—CECIL and AUSTIN (*Jour. Exper. Med.*, 1918, xxviii, 19) reported successful results with prophylactic vaccination against pneumococci of types I, II and III. They vaccinated 12,519 men at Camp Upton, using a saline suspension of dead pneumococci of these three types. The vaccination against type IV was thought impractical. But one case of pneumonia of the types contained in the vaccine occurred during about ten weeks' observation. This case, type I, developed twenty-four hours after the first inoculation, before immunity could have been produced. Nine cases due to type IV pneumococci and seven due to streptococci occurred during the same period. The type IV cases ran a very mild course. 19,481 unvaccinated troops were used for controls. Among these there occurred during the ten weeks' observation 26 cases of pneumonia, due to pneumococci of types I, II and III; 34 cases due to type IV and 106 due to streptococci. They suggested that cross-protection may explain the small number of type IV cases among the vaccinated troops. No explanation is offered to show why the vaccinated troops were spared in the streptococcus-pneumonia epidemic which must have occurred. These results and those previously reported by Lister working in South Africa are very convincing that protection

can be afforded against the specific types of pneumococci used in the vaccine. No cases of the types against which Lister vaccinated occurred over a period of nine months. Experiments made before the inoculation demonstrated the production of agglutinins and the protection the serum of vaccinated individuals conferred on mice. The total dosage to each man was six to nine billions each of dead pneumococci, types I and II, and four and a half to six billions, type III, this given in three or four doses at weekly intervals. The first inoculation contained one billion of each type. The constitutional reactions were slight, only twenty-five men of the entire number vaccinated being sufficiently ill to remain in quarters or the hospital. Those upset by the first or second inoculation usually received no further injections. A small percentage developed tender, painful infiltrations at the site of injection which progressed favorably without surgical treatment. Since the work at Camp Upton, CECIL and VAUGHAN (*Jour. Exper. Med.*, 1919, xxix, 457) vaccinated 13,460 men at Camp Wheeler against pneumococcus infection, using a lipovaccine. By this method one inoculation was sufficient. The dose consisted of 1 c.c. of an oily suspension containing ten billion each of pneumococci of types I, II and III. The local reactions were less than those produced by the saline vaccine. During three months' period of observation the incidence rate of pneumonia of all types among the vaccinated troops was less than one-half that among the unvaccinated. However, 32 cases of pneumonia of the types contained in the vaccine occurred, but of these 24 cases developed within one week of vaccination. These were considered to have occurred before immunity was established. The remaining eight cases were secondary to influenza.

Studies on Tuberculous Infection.—By the use of a strain of tubercle bacilli of the human type of relatively low virulence, KRAUSE (*Am. Review of Tuberculosis*, 1919, iii, 1) has been able to report some interesting facts in man and animals. He used the strain known as Ri, which Dr. Trudeau isolated in 1891. At the time of isolation it exhibited standard virulence for guinea-pigs, but gradually underwent a diminution in degree of infectivity, reaching a point from which it has never varied one way or another in the past twenty years. By inoculating guinea-pigs with Ri it was possible to produce a series of conditions which are in many respects comparable to those obtaining in most human beings suffering tubercular infection. The infection with Ri is slow in developing and does not bring about an advanced tuberculization of the entire body, nor did it ever bring about the death of the animal. The animals were allowed to live for two years and more, and were invariably in perfect physical condition during that time. No gross visceral lesions were found and but slightly altered regional lymphatic nodes. These latter when sectioned always revealed tubercles, usually of a sclerotic type, with central necrosis and caseation. The tracheobronchial nodes had enlarged more than the regionary nodes of the same animals and the lesions were of a more advanced type, suggesting infection by way of the respiratory tract instead of subcutaneously. Not the slightest change was to be found in the lungs. The author believes that a similar localization occurs in human beings, that is, the tracheobronchial nodes showing evidence of infection and

the lungs remaining clear. Cornet's work substantiates that of the author's when he found that inhalation of attenuated bacilli in dust set up manifest tubercle in the tracheobronchial nodes, although none were detectable in the lungs. There are many interesting problems involved in such a study, and the author gives his general result in the hope that it may throw some light on the various disputed and important phases of tubercular infection. The resistance of various tissues to the invasion of the tubercle bacillus must be studied and fully appreciated. Also, the peculiar anatomy of the lungs in experimental animals and the human must be carefully considered when drawing conclusions from experiments. This latter point has not received sufficient notice and may aid in solving the great problem of what we may call the "natural" mode of pulmonary infection in human beings, which at present is still in a purely speculative stage.

An Experimental Study of Vaccination against Bacilli Dysenteriæ.—Following upon the development of typhoid and paratyphoid vaccines suspended in vegetable oils by Le Moignic and Pinoy and by Tribondeau OLITSKY (*Jour. Exper. Med.*, 1918, xxviii, 69) applied this method of suspension to dysentery vaccine (B. dysenteriæ, Shiga and Flexner), with a view to lessening the intensity of the local and systemic reactions produced by saline vaccines of the same organisms. The exact nature of the oils not as yet having been revealed by the French investigators, he experimented first with rabbits, using various oily vehicles for his vaccine. Olive oil saturated with lanolin proved unsatisfactory. Filtering the "lipovaccin" of Le Moignic and Pinoy through a Berkefeld filter and using the filtrate as a vehicle eliminated the toxic reactions. Almond oil used alone as a vehicle also proved satisfactory in rabbits, giving no systemic reaction and a small local reaction. The degree of protection received was as high as that with saline vaccines, this protection remaining practically undiminished for a month; rabbits at this time were protected against ten lethal doses of a Shiga culture and four lethal doses of a Flexner culture injected intravenously. In his experiments with eight men he found that a single injection of a neutralized almond-oil vaccine, 0.5 c.c., containing $2\frac{1}{2}$ billion bacilli, equal parts of Flexner and Shiga, resulted in slight or no systemic reaction and only a moderate local reaction. Agglutination appeared about the seventh day and lasted for at least a month. The slower rate of absorption seems to be responsible for the lessened reaction, the writer showing that while a saline vaccine disappears from the site of injection in twenty-four hours an oily vaccine does not disappear until after the third day.

Rocky Mountain Spotted Fever in the Domestic Rabbit.—The first studies of "tick fever" carried on by Wilson and Chowning indicated that the tick was the medium of transmission, and described a piroplasma in the blood. King and Ricketts confirmed the finding that the disease is transmitted by the tick; but they as well as Stiles (1905) failed to find the organism in the blood. While Stiles had doubted the susceptibility of the domestic rabbit to Rocky Mountain spotted fever, Rucker (1912) reported that rabbits suffered from only a very mild form of the disease. Ricketts and Comez, in a brief publication, asserted that the rabbit was not susceptible to the ordinary virus but

could be infected only after the virulence had been raised by animal passage. Parker, during recent work in Montana, has offered the suggestion that the rabbit may at least be an occasional carrier. Because of this and of the previous differences of opinion, Foot (*Jour. Med. Res.*, 1919, xxxix, 495) repeated Comez's experiments, with some additional work, in an attempt to discover whether the rabbit may not contract this disease. In the first place it was definitely established that infected ticks may transmit the disease to rabbits. The onset occurred seven days after ticks had been applied to a shaved area over the abdomen; the animal showed swelling and tenderness of testes and scrotum, with congestion of the skin over the scrotum; microscopically, typical vascular lesions were found; and the minute diplococcus described by Wolbach was demonstrated in the intima of vessels of the testis and skin. Guinea-pigs inoculated with heart's blood of these rabbits developed a mild and atypical form of the disease. The next step was a study of the susceptibility to injected virus, carried out by intraperitoneal injections of heart's blood from an actively infected donor. This was further studied by transfer from rabbit to rabbit until a rather curious finding was developed, namely, a fairly natural immunity of the rabbit. Certain it is that rabbits sustain the infection much better than guinea-pigs. Only two out of a series of twenty-two rabbits died spontaneously, while guinea-pigs practically succumb at the seventh to ninth day of the disease. The statement of Ricketts and Comez that the offspring of immune parents in the case of guinea-pigs are immune to the disease and that even if only one parent were immune there is still a certain amount of immunity conferred on the offspring, led to a series of breeding experiments, with the conclusion that there is no certain transmission of immunity in the case of the domestic rabbit. Under the heading of gross pathology are included the findings of acute hemorrhagic orchitis and epididymitis, frequently going on to necrosis; acute splenitis; acute inguinal lymphadenitis; the liver and lungs showed only congestion; the skin showed petechial hemorrhages; the ears were swollen, tender and injected, and, later, owing to thrombosis, gangrene and sloughing frequently destroyed a large part of these structures. Microscopically, the lesions were found in the smaller veins and arteries and the capillaries of certain organs. Here the endothelial lining showed intense proliferation, with frequent mitotic figures. This proliferation was so marked that necrosis of the heaped-up cells occurred with resultant thrombosis of the vessels. The diplococcus of Wolbach was found in these intimal lesions, likewise in the media, and in the large perivascular endothelial collections which were also a feature of the reaction. The proliferative reaction was soon complicated by migrating polymorphonuclear leukocytes, fibrin and other inflammatory products. It is readily seen, therefore, that such reactions, by occluding vascular channels, are the basic factor in producing hemorrhage, infarction and gangrene, the chief characteristics of the disease.

The Fate of Typhoid Bacilli Injected Intravenously into Normal and Typhoid Immune Rabbits.—Following the work of Hopkins and Parker on the fate of hemolytic streptococci injected into susceptible

and immunized animals, PARKER and FRANKE (*Jour. Med. Res.*, 1919, xxxix, 301) took up the study of the same phase of immunity. They report a failure to confirm the finding of the previous workers that the organisms are largely taken up by the lung. In the latter study, however, the B. typhosus was employed, owing to the greater ease with which rabbits may be immunized to this organism. The technic included injection of a twenty-four hour agar slant culture emulsified in sterile saline solution. Normal animals were killed within ten minutes after injection and the various organs were tested out immediately for their bacterial content. Portions of the same organs were also incubated, during three or four hours, in order to study the bactericidal action of these tissues *in vitro*. The bacterial count on the various tissues was accomplished by a plating method being estimated on the number in 0.1 gm. of tissue ground up in 1 c.c. of sterile saline solution and cultured in poured agar plates. The results of these experiments on normal rabbits indicate that the liver contains by far the greatest number of organisms per weight unit. The spleen averages half as many, and the lung and bone-marrow about one one-hundredth of the count in liver. Cultures from the incubated tissue showed evidence of bactericidal action only in the lung. Here, however, the interesting fact was discovered that the bacterial count was reduced to one-twentieth of that in lung cultured immediately after removal. The same experiment *in vivo* accomplished by allowing the injected rabbit to live for three or four hours produced the opposite result, in that of all the body tissues the bone-marrow alone showed bacteria. To allow this condition to either readjust itself or reach its maximum another animal was injected with the usual dose and allowed to become moribund before being killed. This animal, then, after fifty-three hours, gave a bacterial count of millions of B. typhosus in the bone-marrow while the other organs showed numbers running in the hundreds. A similar series of experiments was then undertaken with immunized animals; but the results, as previously stated, were merely to indicate that a slightly greater localization of bacteria occurs in the lungs in the immunized animals. There is no difference in the bactericidal power of the tissues of normal and immunized rabbits. The bone-marrow, in its new role as a harbor for active bacteria, from which the blood stream may be invaded at recurrent periods, is an interesting fact brought out by this work.

A Bacillus of the Colon Group Isolated from Cystitis Urine.—The B. coli group as probably the most frequent cause of cystitis is again brought to the fore by an elaborately worked-out study of a recently isolated atypical strain of this organism. NIVA (*Jour. Med. Res.*, 1919, xxxix, 469) recovered the organism in question in pure culture from a case of chronic cystitis in an elderly individual. The morphological and cultural characteristics were worked out by him in great detail. Fermentation reactions were studied on a series of nine sugars. The usual biochemical tests were performed, with the exception of that for the reduction of nitrates. Motility was not demonstrable, even in very young broth cultures. In general it may be said that the organism corresponded exactly to the typical B. coli communis, save in its reaction on some of the more unusual differential sugars and in the absolute

absence of motility. The sum total of the study of this culture revealed a strain slightly different from any yet isolated, though it finds its place as one of the theoretical subgroups in several of the standard classifications. Pathogenicity for the mouse and guinea-pig was studied, with positive findings in these animals. Agglutination tests were made, using the serum of the patient, the serum of one of the inoculated guinea-pigs which had developed a subcutaneous abscess due to the organism in question and the serum of a normal individual. The serum of the patient and of the experimental animal had strong agglutinating power. The conclusion that the organism was the cause of the cystitis seems well substantiated. A very full list of bibliographical references is appended.

HYGIENE AND PUBLIC HEALTH

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Increase in Tuberculosis Emphasizes the Need of Food Education.—The statement cabled from London that Germany is suffering an enormous increase in tuberculosis, mainly as the result of the restricted food supply, calls forth a warning from the Department of Health of New York City (*Weekly Bull., Dpt. of Health, City of New York*, December 29, 1917) that despite a much greater amount of food in this country a similar disastrous increase in tuberculosis and other diseases may occur here if the public does not take a greater interest in the science of nutrition. Statistics compiled by Dr. W. H. Guilfoy, the Health Department's Registrar of Records, show that the steady downward course of the deaths from tuberculosis has not only been arrested but that the number this year shows an actual increase over last year's figures. In view of the experience of the other warring nations, this is certainly disquieting. Inasmuch as tuberculosis is so intimately associated with undernourishment, special interest attaches to the report concerning the physical examination of school children. According to this, the number of undernourished school children in New York City is much greater than was heretofore suspected, for one-eighth of all the school children were found to be undernourished. On the basis of a million school children this represents the enormous number of 125,000 undernourished children. One-quarter of this number were so badly undernourished as to require medical care. The Department of Health has been much concerned about the great lack of even elementary knowledge among a large proportion of the people concerning the main facts of food and nutrition. For some years an

effort has been made to teach the people by means of posters, leaflets, food exhibits and demonstrations, but progress is slow. Classes of practical instruction in dietetics have been begun at some of the Baby Health Stations. This work is carried on by the nurses of the health stations, for they know the needs of the mothers in their district.

The Regulation of the Intestinal Flora through Diet.—TORREY (*Jour. Med. Research*, January, 1919, p. 415) states that it is now well known that diet exercises a profound influence on the determination of the types of bacteria developing in the intestinal tract. In fact, under conditions of normal physiological functioning within the digestive tube it is the fundamental factor. The work of HERTER and KENDALL (*Jour. Biol. Chem.*, 1910, vii, 203) was the first to establish clearly this fact. Under normal physiological conditions the fundamental factor controlling the types of bacteria vegetating in the intestinal tract is the chemical character of the food ingested. Secondary controlling factors of almost equal weight are the rate and degree of the digestion and absorption of the food and the character of the end-products of the digestive process. It has been demonstrated experimentally in Torrey's investigation with dogs that, on the one hand, not all carbohydrates have an equal tendency to establish a purely fermentative intestinal flora, and, on the other hand, not all protein foods encourage putrefactive conditions in a like degree.

The Effect of Carbon Dioxide in the Cultivation of the Meningococcus.—GATES (*Jour. Exper. Med.*, 1919, 4, xxix, 321) states that the meningococcus is not a "micro-aërophile." It grows equally well in atmospheres containing from 15 to 40 per cent. oxygen. If small amounts of carbon dioxide affect the growth of the meningococcus on an artificial medium it is by changing the reaction of the medium, not by slightly reducing the oxygen tension of the surrounding air. The fallibility of titrating the total acidity of a medium is again clearly demonstrated. A reaction favorable to the meningococcus cannot be determined from the total titratable acidity but depends solely upon the hydrogen ion concentration of the medium. The optimum for the meningococcus is approximately at pH 7.4. The value of a moist chamber in the cultivation of the meningococcus is shown by unusually luxuriant growth when other conditions are also favorable.

Pneumonia Following Influenza.—MCCALLUM (*Jour. Am. Med. Assn.*, 1919, lxxii, 720) states that the epidemic disease influenza resembles in many respects measles and other acute exanthematic diseases. Nothing is definitely known as to its causative agent. It produces great lowering of resistance to bacterial invasion and is therefore often followed by pneumonia caused by the different types of pneumococcus, Staphylococcus aureus, Streptococcus hemolyticus or the influenza bacillus of Pfeiffer. In some regions the influenza bacillus is a particularly common secondary invader. In other regions it is insignificant, its place being taken by one of the pneumococci. This may depend on an epidemic or endemic distribution of these organisms as inhabitants of the nasopharynx. The form of pneu-

monia produced after influenza is greatly modified by the lowering of resistance, which allows huge numbers of bacteria to grow. Nevertheless, the types caused by the pneumococcus, streptococcus and influenza bacillus are to be sharply distinguished. Probably the type caused by the staphylococcus will be shown to have distinctive peculiarities when adequate material has been studied.

The Effect of Pressure on Certain Microörganisms Encountered in Preserving Fruits and Vegetables.—HITE (*Bull.* 146, *West Virginia Agricul. Exper. Sta.*, October, 1918) finds that a pressure of 100,000 pounds per square inch at room temperature destroys most non-spore-bearing bacteria. Under these conditions milk containing from 30 to 40 millions per cubic centimeter may be reduced to a few hundred by the application of 100,000 pounds for ten minutes. The pressure does not affect the enzymes. Forty-five thousand pounds' pressure is sufficient to kill B. typhosus in beef broth in ten minutes. B. diphtheriæ in beef broth are killed at 40,000 pounds' pressure in ten minutes.

Relation of Meteorological Conditions to the Prevalence of Pneumonia.—GREENBERG (*Jour. Am. Med. Assn.*, 1919, lxxii, 252) states that in studying the death-rate of lobar pneumonia in its relation to meteorological conditions, it has been found that: (1) Temperature *per se* is the most important controlling factor; (2) a low relative humidity is conducive to a high-death rate, and a high relative humidity to a low death-rate; (3) increases in the death-rate correspond to increasing temperature variations.

Origin of the So-called Auto-intoxication Symptoms.—ALVAREZ (*Jour. Am. Med. Assn.*, 1919, lxxii, 8) states that "auto-intoxication" is commonly diagnosed when a physical examination would show other more definite causes for the symptoms. Those who believe that intestinal stasis can account for a long list of disease conditions have little proof to offer for their views. Many of the assumptions on which they rest their case have been proved to be wrong. The usual symptoms of the constipated disappear so promptly after a bowel movement that they cannot be due to absorbed toxins. They must be produced mechanically by distention and irritation of the colon. They occur in nervous, sensitive people. It has been shown that various activities of the digestive tract can profoundly affect the sensorium and the vasomotor nerves. The old ideas of insidious poisoning lead to the formation of hypochondriacs: the new explanation helps to cure many of them.

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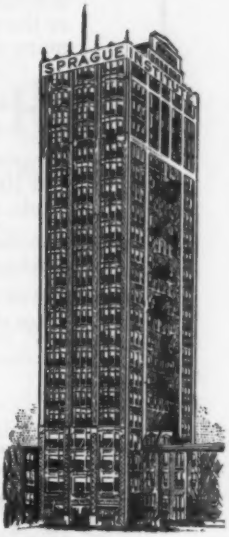

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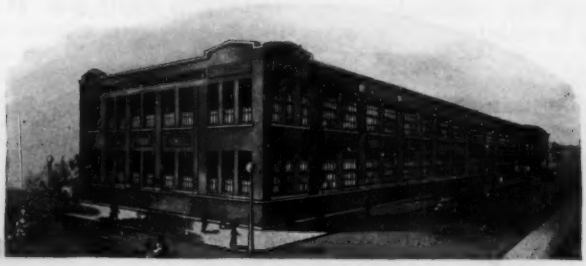

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Food elements that seem to be particularly well adapted, mixtures that are suitable to meet the usual conditions, and the general management of the diet, are described in our pamphlet—"The Feeding of Infants in Diarrhea"—a copy of which will be sent to any physician who desires to become familiar with a rational procedure in summer diarrhea.

Mellin's Food Company, **Boston, Mass.**

THE GLEN SPRINGS

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WM. E. LEFFINGWELL
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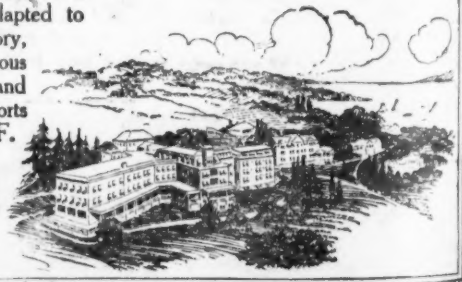
A MINERAL SPRINGS HEALTH RESORT AND HOTEL

The Pioneer American "Cure" for Heart Disorders

The only place in this country where the Nauheim Baths for Heart and Circulatory Disorders are given with a Natural Calcium Chloride Brine

Hydrotherapy, Electrotherapy, Massage

The treatments under the direction of physicians are particularly adapted to HEART DISEASE, Circulatory, Kidney, Nutritional and Nervous Disorders, Rheumatism, Gout and Obesity. Splendid facilities for sports and recreations. FINE GOLF.



Physicians are requested to send for literature detailing treatments, Mineral Springs analyses and other particulars.